Studies in Mental Deviations

S. D. Porteus

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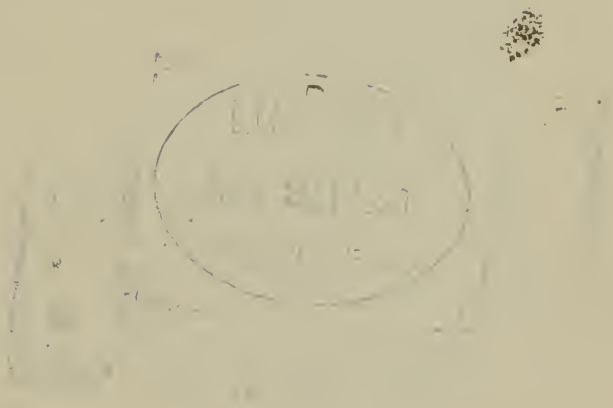

STUDIES
IN
MENTAL DEVIATIONS

STUDIES IN MENTAL DEVIATIONS

BY

S. D. PORTEUS

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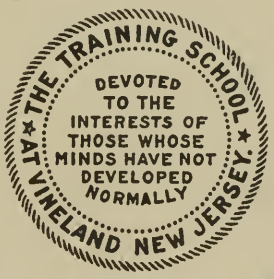

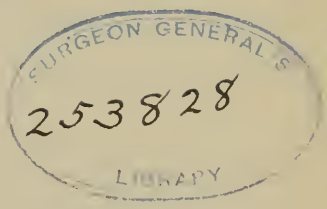

PUBLICATIONS OF
THE TRAINING SCHOOL AT VINELAND, N. J.
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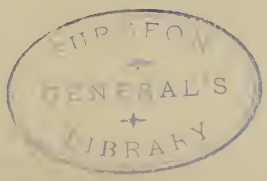

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PREFACE

The student of the problems of mental deviation is fortunate indeed to be able to avail himself of the splendid opportunities for research provided at the Training School at Vineland, New Jersey. For almost a quarter of a century this institution has developed under the inspiration and according to the vision of its most able superintendent, E. R. Johnstone. His constant aim has been to further the interests of the individual child and is expressed by the motto of the school—"Happiness first, all else follows." The chief means for attaining this end has been the development of the child's ability in whatever directions and to whatever degree is possible. No greater tribute could be paid to Johnstone's great work than the loyalty of adherence of the Vineland people to the principles he has laid down. The child's training is carried on by many hands, through many ways. I have not hesitated to make the whole institution my research field and to draw on the great stores of experience that have accumulated during the twenty years' service of some of its officers. It is not my belief that the best observations of the psychology of defectives are to be made through the laboratory windows, nor that the only information of value regarding defectives is possessed by psychologists. Rather am I convinced that some of the best research lessons may be learned through the analysis of the experience of those who have known and studied the defec-

tive through the many long years of his training and development. There is hardly an employee of the Training School who has not added his or her quota to this study. The following pages, by constant reference and appeal to this fund of practical experience, will show how great is my indebtedness. For unfailing and invaluable assistance I owe most to Mrs. A. M. Nash, without whose expert aid much of the data could not have been gathered or interpreted. The members of the Board of Trustees, by their personal interest and encouragement, have also assisted.

Without the most loyal and efficient help of the staff of the laboratory the work of the last three years could not have been reported, even in its present form. Misses Babcock, Flowers, Bassett, Macfarlane, Pearson and Myers, and Messrs. Yepsen and Kellerhals, who have at one time or another during the past two years been members of the staff, have rendered great assistance in the collection and analysis of data.

There remains one word of appreciation which it gives me great pleasure to be able to say. The work of the Vineland Laboratory has for the past fifteen years been well received not only throughout this country but in many countries abroad. Dr. Goddard's fine contributions are extremely widely known and have undoubtedly stimulated many other researches. The laboratory during his directorship assisted in the training of many who are now eminent in the field of subnormal psychology. Its publications are well known and in high demand. It should be equally well known that the laboratory itself would not have existed but for the splendid support of Mr. Samuel S. Fels of Philadelphia, who has so generously financed it throughout all these years.

I feel that I owe to Mr. Fels not only the valued opportunity to come from Australia and work in this laboratory, but what to me is almost as important—a constant fund of close personal interest in the objects and results of the work itself. Encouraged by this attentive interest and also by that of the other members of the Research Committee,—Professor Johnstone and Dr. M. J. Greenman, Director of Wistar Institute—I have been stimulated to make this account of my stewardship as director of research as thorough as the time available would allow. Three years is, in research work, a comparatively short space of time. Much of the work presented in these pages has a tentative application and would not have been so hastily reported except that this may be the only opportunity to present it in published form. Because the studies undertaken have some original features it was thought better to make even a hasty presentation than none at all. The form of publication is that suggested by its title—a series of studies apparently disconnected but all bearing a close relation to mental diagnosis.

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STUDIES
IN
MENTAL DEVIATIONS

CHAPTER I

AIMS AND METHODS

In February, 1919, the writer succeeded Dr. H. H. Goddard as director of the psychological laboratory of the Training School at Vineland, New Jersey.

The program of research consisted of a somewhat comprehensive plan for the study of the inmates of this institution through clinical examinations. These examinations included not only the application of mental tests, but the study of the individual from the standpoints of his physical development, his industrial aptitudes and skill, his educational requirements, and the traits of his personality that also affect his capacity for self-management and self-support in the community of his fellows.

The most commonly quoted definition[1] of mental deficiency emphasizes the social criterion, the defective's inability "to compete with his fellows on equal terms" or "to manage himself and his affairs with ordinary prudence." Because of the difficulty in interpreting these conditions the writer has endeavored to construct a definition of feeble-mindedness[2] which combines the essential points of other definitions in a succinct form. In order to satisfy requirements the new definition should make evident:

[1] "British Royal Commission," 1908.
[2] "A New Definition of Feeble-mindedness," by S. D. Porteus, Training School Bulletin, March, 1921.

1. That feeble-mindedness results in a condition of permanent social inadequacy.

2. That this social inadequacy is essentially dependent upon a psychological condition. (This, in turn, may be dependent upon a physical condition, but as the latter is not always demonstrable it may be omitted from the definition.)

3. The definition should exclude other socially inadequate groups, not feeble-minded, such as the insane, the deaf and dumb, the blind, the physically defective, the criminal and the immature normal. It should include all forms of feeble-mindedness, whether congenital or acquired.

The definition which we would propose is: *A feeble-minded person is one who by reason of mental defects, other than sensory, can not attain to self-management and self-support to the degree of social sufficiency.*

It will be noted that the words "can not attain" involve the idea of a permanent condition of under-normal development. At the same time they exclude by implication the senile, the insane or the psychopathic adult, since it is obvious that we would not apply this description to a person who had already attained to social sufficiency and degenerated. They also exclude the immature, but potentially normal.

The words "by reason of mental defects" point out clearly the psychological cause of the condition, and the use of the plural "defects" implies that the disabilities may be either special or general. The use of the word "mental" excludes the criminal, the physical defective and the epileptic who is not also feeble-minded.

Equal emphasis is placed upon the capacity for self-

management, as well as for self-support. In this way both the mentally unstable and the industrially incompetent are included. Both the congenital and acquired forms of feeble-mindedness will come under the definition. If the case is traumatic there is no need to state the age at which the injury occurred. Provided it has prevented the individual from ever attaining self-management or self-control, it is obvious that it must have occurred in the developing period.

Finally social sufficiency or the ability to float in society is made the touchstone of normality.

It may be objected that this definition postpones the recognition of feeble-mindedness in some cases to adult life or to such a time as the individual may prove his social insufficiency. This is inevitable so long as the definition rests on a social criterion, but increasing study into the prognostic value of mental tests will reduce the number of these cases of deferred diagnosis. In doubtful cases the description "potential social inefficient" is sufficient for all practical purposes. In such cases the question of the cause and the curability of the condition, whether in fact it be feeble-mindedness or otherwise, can only be solved by continued expert observation.

Another objection which might be advanced is that the highest grade of feeble-minded may attain for a time to self-management and self-support under specially favorable conditions. It was possible for many defectives to support themselves during the war on account of the great demand in certain industries for comparatively unskilled and, for the time being, well-paid labor. With the passing of these conditions the less efficient individuals have been set adrift and many undoubtedly will again require social guidance and assistance. It should, however, be understood that a merely

temporary condition of self-dependence, under special circumstances, will not be held to constitute social sufficiency. As a matter of fact many institutions would be safe in dismissing their highest grade cases for limited periods of self-dependency, varying from one month to six, without grave social consequences, but in most cases the social adjustment would be only temporary.

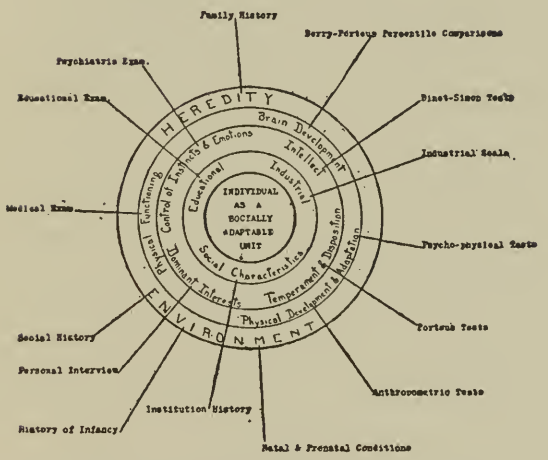
The choice of the lines of investigation that have been pursued in these studies has been determined by the fact that the physical, mental, industrial, educational and social characteristics of the defective have each an important bearing on his social adaptability. The relation of these various factors to social adjustment in the individual has been schematically represented by Figure I, which also shows how these factors have been evaluated by the application of the various parts of our examination method. This scheme does not pretend to give an accurate psychological analysis of the problem. Its prime object was not to provide such an analysis but to show that our methods of investigation though apparently disconnected, were all necessary angles of approach to a well rounded study of mental deviations. Mainly because it may add coherence and establish threads of connection between the various sections of this volume, it merits some further consideration.

In passing it should be stated that some of the matter presented in the following pages has been published in the form of research bulletins dealing with single studies or investigations. Parts of our examination methods which are new, or which represent improvement on existing methods were published separately in the hope that they might prove useful to workers in other clinics or research stations. In the past two years these tests and publications have had

The Training School at Vineland N. J.

RESEARCH DEPARTMENT, S. D. PORTEUS, Director

Plan for Study of Defectives



This chart shows the factors which affect the social adaptation of the individual. Factors on the same ring interact and also stand in causal relation to other factors inscribed on any inner ring. For instance, one case may be socially inefficient because of poor educational ability dependent upon small intellect, which may itself be due to a poor brain development—the last named condition being due to hereditary causes. If we suppose the concentric rings to rotate independently, then we may have any combination of factors forming dominating lines of influence on the social adaptability of the individual.

The relation of all parts of our clinical method to various factors is shown by the direction of the arrows.

Fig. 1. Plan for the Study of the Individual.

a very wide area of circulation embracing every country where work with defectives is being carried on. The demand for assistance in the problem of mental diagnosis is so great that it has been deemed advisable to embody in this study some previously published results, so that the various parts of our methods should not be considered in isolation, but in relation to the general plan.

In Figure 1 the factors which affect the social adaptability of the individual are inscribed on concentric rings. Those of most general relation are placed furthest from the centre and stand in more or less direct causal relation to the factors inscribed on each of the inner rings. Factors on the same ring tend to interact. The factors of most general import are, of course, the heredity and environment of the individual. As regards heredity, the facts of family history are gathered from the relatives of the child. From the research standpoint this field of inquiry has been adequately covered by the extensive observations gathered by Dr. Goddard and his co-workers, so that special studies along this line have not been undertaken.

The environmental history comprises the facts regarding pre-natal and early post-natal conditions and the general infantile development. These facts are often interesting, as throwing some light on the etiology of the condition, but have not been gathered with sufficient fullness or care to have any special research interest at present.

Of a less general nature are the physical factors affecting social adjustments. Probably of most direct importance is the brain development. Obviously we have no direct means of estimating the relative development of the various functional centres in the brain. However, we can estimate, though somewhat imperfectly, the brain capacity as a whole,

from various head measurements. This estimated brain capacity may be compared with the percentile table for normals prepared by Berry and Porteus. Part of the present study will deal with the tendency of deficiencies in brain capacity and abnormalities of head form to be associated with mental deviations.

A plan of study which considers the defective only from above the eyebrows would, of course, be inadequate. Brain capacity is only part of the general somatic development. Mental defect has been shown by Goddard[1] and Doll[2] to be associated in very many cases with a general physical inferiority. Still more marked is the defective's incapacity for adapting his muscular mechanism to an intensive or sustained physical effort. This is demonstrated by his usually poor records of strength of grip and vital capacity. This physical inferiority undoubtedly affects the individual's industrial capacity and hence has a bearing on his social adaptability. As regards this part of the investigation the ground has already been well covered by Doll so that only a small section will be devoted to it here.

Right physical functioning—the health of the individual —has also a most important relation to social adjustment. Physical growth, not only of the central nervous system but of the body generally has been shown to be largely controlled by the glands of internal secretion. Not less important from the standpoint of mental integrity is the proper functioning of all the bodily organs. The importance in relation to psychopathy of the presence of foci of infection has been recently demonstrated. This is a field of inquiry which belongs wholly to medical science and though it is

[1] "The Height and Weight of Feeble-minded Children in American Institutions," by H. H. Goddard, 1912.

[2] "Anthropometry as an Aid to Mental Diagnosis," by E. A. Doll, Research Publication No. 8, Training School at Vineland, N. J.

part of the general program of research of the laboratory it is outside the scope of this publication.

The next ring on the chart contains the psychological factors which rest on the physical basis of general bodily development. The intellectual development, as expressed by the mental level, is certainly of great importance when we consider the potentialities of the individual for social sufficiency. Intellectual development has been studied chiefly through the application of the Binet-Simon tests. The form of tests used has been the Stanford Revision modified in accordance with our experience to make it more applicable to and reliable with defectives. Through the selection of certain tests from this series, a "diagnostic score" is also obtained. This division of the tests serves to give us a partial analysis of the subject's test results and enables us to differentiate children of good native ability from those whose mental level has been largely affected by previous training.

Whilst it may be difficult to over-estimate the importance of mental level as regards social adaptability, it is very easy to under-estimate the importance of temperament and disposition. As regards industrial adjustments, mental contentment may be fully as important as mental content. It should be noted in this connection that we are using the word temperament in an every-day rather than in the accepted psychological way. In this sense, temperament may be considered as determining the character of an individual's mental attitude in his affairs or in social relations. This is evidently what is meant when we speak of a person possessing a pessimistic, a surly or a changeable temperament.

Some valuable indications, not only as to the planning capacity of the individual, but also as to such temperamental characteristics as tendencies to hasty or impulsive action or

to a too marked or too diminished self-confidence are obtainable by the application of the graded maze tests. This present volume contains the last of a series of intensive studies that have been carried on during the past ten years on the application of these tests. These studies have been undertaken in order to provide interpretations of maze test results in terms of their relation to mental development as measured by other tests, in relation to industrial capacity, and to social adaptability generally. Including examinations for standardization purposes, I have applied these tests to upwards of six thousand cases, comprising normal and feeble-minded groups, deaf and dumb, epileptics, delinquents, psychopathics and to children of primitive races. Even with this body of data available, no claims are made that this represents a completed task. The work has been undertaken on this scale because of the author's realization of the extreme complexity of almost every problem of mental measurement. The devising of tests is a comparatively simple matter—it is the work that is done in the proving of the tests that determines their practical value. Since there are such wide limits to human ingenuity, there is no reason why mental tests should not continue to multiply a thousandfold without, however, measurably advancing the science of mental measurements, unless there is also a painstaking and conscientious attempt to supply such data as will render their interpretation possible.

Any study of an individual, whether it be for diagnostic or prognostic purposes, which fails to take account of his dominant interests and motivation is certainly incomplete. An interest in mechanical construction may, for instance, be made the sheet-anchor for a life that might be otherwise shiftless and delinquent. Even psychopathic tendencies may

be checked or diverted by an appeal to some interest of the patient. Social adjustment through the removal of an unhealthy interest such as unsatisfied sex curiosity is often made possible. The importance of such a method of approach in the study of the individual has been emphasized by Healy.[1] The influence of mental conflicts in the genesis of social maladjustment is probably greater than is generally thought. It is not, however, necessary to attribute a sex basis to all of these conflicts. The results of such psychological analyses can, however, be presented only by the case history method of which Healy has given such splendid illustrations. This method is most applicable to delinquents but concerns also a number of the feeble-minded.

The individual's control of emotions and instincts is a matter for skilled psychiatric treatment. The value of the psychiatric approach to the problem does not lie in the classification of a case as a "constitutional inferior" or in attaching some other labels of equally blessed significance, but rather in the detailed analysis of the causes of mental maladjustment and the discovery of trends and tendencies which, if left unchecked, may lead to a definite psychosis. Because the arrow in the chart points only to "control of emotions and instincts" this does not mean that there is any implied limitation of the scope of psychiatric examination. We are merely stating one of its most evident fields of action as regards our problem.

The foregoing psychological factors underlie the development of certain abilities essential for successful social adaptation. Of these abilities—educational, industrial and social—the first named is, as regards defectives, of least

[1] The Individual Delinquent. By Wm. H. Healy. Little, Brown, and Co. 1915.

importance. The small degree of educability in the three R's of school instruction possessed by many of the definitely feeble-minded hardly justifies the effort that is spent in teaching these subjects in the special classes. By means of a specially arranged scale of educational attainments we have endeavored to measure the abilities of a group of defectives at present under instruction. By applying the same scale to a group who passed through the school some years ago, it is hoped that some lessons of practical value in the school instruction of defectives will be obtained.

Since educational ability is so limited the industrial trainability gains added importance. In order to measure the industrial acquirements of defectives, we have employed an industrial ratings scale which provides an analysis of each occupation in the institution and shows the various steps in proficiency. In addition, the scale shows the comparative value of each occupation for children of the various grades of mental defect.

Before we can finally assess the "community value" of the defective we must consider his degree of possession of various anti-social traits. The extent of guidance and protection which must be provided for the individual will depend largely on his suggestibility, his lack of planning capacity or executive ability, his ability to restrain impulsive action, and whether by silly or obtrusive behavior he advertises his lack of judgment and common sense. Between the fool with his mouth shut and the fool with his mouth open there is a very wide social difference, even though the level of intellectual attainments of each be the same. All these traits and others are taken account of by the social ratings scale which analyses these aspects of the personality of defectives.

The class of case to whom the social ratings scale applies is composed of those whom the community segregates for their protection. There is also the class of case whom the community segregates for its own sake. These are the defectives who are also morally delinquent or psychopathic. From the standpoint of abnormal or immoral behavior, our cases have also been studied and classified.

This plan of study embraces, therefore, all the main factors in personality—intellect, skill, temperament, morality, as Warren[1] has stated them. In addition to these we have added a fifth—physical development. Whilst our plan is laid down on broad lines we do not pretend that our studies are by any means exhaustive. Our aim has been merely to set out the foundations upon which further and fuller research may be built.

We agree with Healy[2] when he says: "When really good chapters on the analytic psychology of mental defectives shall have been written, we may learn something of the complexity that most certainly exists in the mental life of the feeble-minded, which to many seems a simple affair." This book does not presume to attempt to present any such chapters. If, however, it contains some of the material of which the analytic psychology of mental defect must take account, then its highest aims will be fulfilled.

[1] "Human Psychology," by Howard C. Warren. Houghton Mifflin Co. 1919.
[2] "Pictorial Completion Test II," by Wm. J. Healy. J. of Applied Psy. Sept. 1921.

CHAPTER II

MATERIAL AND CLASSIFICATION

Whether we study physical or mental development, social or moral characteristics, there is hardly any generalization of value that can be safely made regarding all the inmates of an institution for the feeble-minded. There are many causes of feeble-mindedness apparently operating at different periods of mental and physical development and with different degrees of effect. A paralytic case for instance, may differ very widely from the mongolian or the cretin. Psychopathic feeble-minded differ very much from the stable type. The fact that all the cases may be segregated together in an institution by no means proves that there exist very marked resemblances between the various groups Indeed, diagnosis has been so slip-shod a matter that it is probable that almost every institution for feeble-minded contains a proportion of children whose mental status even after long residence is still doubtful.

As regards the cases to whom the general term "feeble-minded" readily applies, even these differ so much between themselves that the question arises as to whether we should not speak of "the feeble-mindednesses" rather than use the term in the singular. Mental deviations is probably the best term to use in a collective sense.

In our studies of mental deviation, then, we are faced at once with the problem of the proper classification of cases. Unfortunately, a medical classification based on eti-

ology and which includes such terms as sclerotic, hydrocephalic, traumatic, paralytic and the like, does not help us in the least. Since mental tests are now of such common application, a natural expectation might be that we would base our classification of cases upon mental age levels. This plan, however, though useful up to a certain point, is also disappointing for many practical purposes. It must be admitted that there is an idea prevalent that grouping by mental ages would be the most scientific plan possible in an institution. The superintendent, however, who, for such practical purposes as cottage life or industrial placement, groups his cases by mental age, except within very wide limits, would soon find his institution at sixes and sevens. Possible exceptions to this statement would be those groups which contain cases of the very lowest and the very highest levels. The low grade cases would not be so much distinguished by ability as by the lack of it. It matters very little whether an idiot is rated as being of one, two or three years' mentality. The community value of all idiots is about the same. At the other extreme of mental level the highest grade children would be placed together, not because they resemble each other very greatly, but because they differ even more markedly from the definitely feeble-minded. They too will show a very large range of industrial and educational capacity, social and moral characteristics. In order to show how the plan of grading by mental age accords with one founded on experience, I have attempted an analysis of the factors which determine the placement of children in the cottages at the Training School. These cottages differ in capacity from twenty to one hundred cases. The largest cottages are subdivided so that the children on one floor form a division by themselves. The main factors that determine cottage

placement of the children are as follows:

1. Mental level—This applies, as previously stated, with greatest influence to the children of lowest and highest grades.

2. Physical age—Young children are not graded with older cases.

3. Physical development—Feeble-minded children of the same chronological age vary very much in physical development. Some show a precocity in certain phases of development though there is usually evident a general retardation. These facts are taken into account in cottage grading. Paralytic and crippled children are also grouped together in one cottage.

4. Sex Habits.

5. Other delinquent tendencies. These two last named factors must be considered carefully from the standpoint of the protection of the younger children.

6. Personal habits, self help, cleanliness, etc.

7. Social characteristics. The grouping together of boys who are congenial through long association in the institution is found to make for their greater happiness in cottage life.

8. Previous social status and home training. In an institution such as Vineland which takes private and state cases, children are drawn from a very wide range of social grades. Previous home training consequently affects very much the adaptability of certain children to the cottage life.

9. Special Discipline. A child may be placed in an honor cottage as a special privilege for good behavior or he may be changed to another group for disciplinary purposes.

10. Accommodation. A child may be placed in a cot-

tage because of the lack of room in the group which he resembles.

11. Psychopathic tendencies. Children who are noisy, destructive or peculiar in their actions or habits may require special accommodation. This does not mean that they are always put together. Sometimes they are distributed amongst other groups, but there are limits to the number of psychopathic or delinquent cases that a well-adjusted group can absorb.

All of these factors, as matters of expediency, must be considered in the grouping of the children. The mental level is of course important, but the exigencies of the situation with regard to the other factors more often determine the placement of the majority of our cases. As a matter of fact the inmates of one cottage which is considered to be very well graded have a range of mental age per Binet of nine years. In cottages where physical age is taken largely into account, the range of mental age is necessarily lower. It may also happen that in the cottages for small groups, mental level may be taken into consideration after some other factor has determined the placement. For instance, two small cottages both contain children with psychopathic tendencies. Mental level is then taken into account as a secondary factor, one cottage being set aside for the psychopathic of high grades and the other for lower grade cases. As regards the school grading, Binet age is naturally expected to be of more value in the grouping of children in classes. Quite a number of the factors that are of weight in cottage classification have little or no influence in school grading. Still, notwithstanding this fact, there are ranges in the school grades of from three to four years and that, too, in classes containing no more than twelve children. This state

of things obtains, it must be remembered, not in a haphazard grouping of a few children, but of two hundred children carefully graded into about twenty classes for academic instruction and various kinds of manual work. The school is run on the plan of classes visiting each teacher in rotation and this enables small and comparatively homogeneous groups to be formed. There is here a lesson, though of negative application, for special schools. The idea that defective children can be graded best by considering only mental age does not agree with Vineland experience. Other factors that must be considered are physical development, physical age, special aptitudes and disabilities, previous training, psychopathic tendencies and disciplinary considerations, any of which may be, for individual cases, of more importance than mental age. It is probable that, with one or two exceptions, these factors should also be considered in a reasonable grading of normal pupils, so that the value of the suggestion made by some psychologists that mental age should be made the basis of normal school grading is open to question.

It must be admitted that at Vineland mental age is made the *first* consideration in the grading of pupils both for cottage life and school work, but it is equally true that it is first only in point of time and not in importance. Mental age is considered in the first tentative classification of children but comparatively short experience with the individual often brings to light other factors which outweigh mental age in importance. We may say with regard to the cottage grouping that, other things being equal, mental age is of prime importance; but the other things are rarely, if ever, equal.

Certain psychologists may object, of course, that the

reason for these wide ranges in mental ages in cottage or school groups lies in a faulty system of grading. The answer to this is that the present system is the product of twenty years of practical experience, during ten years of which time there has been a conscientious effort to take sufficient account of mental age levels. Persons responsible for the cottage grouping consist of the school director, the head of the hospital and one of the laboratory staff, all of whom firmly believed that the children were graded by mentality until the actual mental age disposition was demonstrated and the other considerations that determined the groupings were elicited. Enough has been said to show that the practical implications from the use of mental tests are not as significant as at first seems apparent.

Space has been devoted to this discussion of the question of school and cottage grading because of its evident relation to the problem of social adaptability with which we are concerned. We wish to show that a study as wide as we propose cannot be properly founded on a mental age basis alone. In the scheme of classification which we have adopted, we have been careful not to term all of our cases feeble-minded. They are, however, all potentially or actually socially inefficient. Following the practical rule adopted in cottage classifications we may make mental age level the basis of the first general division. Without pretending in any way that this constitutes a mental diagnosis of our cases, we have divided them into two groups, those below and those above 75 I. Q. (average Binet-Porteus mental ages.) Those below 75 I. Q. may be said to be at feeble-minded levels. In passing, we might state our emphatic disagreement with those who consider it is possible to base the diagnosis of feeble-minded on the Stanford-Binet divid-

ing line of 70 I. Q. Dr. Terman has recently stated that this dividing line was not proposed as a definite diagnostic limit, but rather as an approximate estimate. This is exactly as we regard it, and taken into account with other test results and considerations it is a useful working approximation. A Binet I. Q. of 70 or less may be regarded as the first presumptive evidence of feeble-mindedness, but by no means as a final diagnostic proof. Though this is almost universally conceded, yet we find study after study, presumably directed towards the problem of what does and does not constitute feeble-mindedness, quoting a Stanford-Binet I. Q. as if it were quite adequate to determine the status of the subjects of the investigation. The practice appears to be on all hands to repudiate such a method of diagnosis and just as generally to adopt it.

As has been mentioned, we use the Binet-Porteus average I. Q. as a measure of the intelligence level. Our justification for believing this to be a safer estimate will be presented in later sections. Yet, useful as this composite I. Q. may be, it is not intended to be any more than a statement of one factor in diagnosis. Wherever the term "feeble-minded" is applied in reference to our groups it should be taken to mean *"at feeble-minded levels of mentality."* In the doubtful case, the level of mentality is not by any means decisive in determining whether the person will be self-managing and self-supporting to the degree of social sufficiency. Mental age is in such cases symptomatic, not diagnostic.

By glancing over the list of factors affecting social adaptability within the institution, it will be seen that although they all affect individual adjustment, some are personal and some merely institutional in their relationship.

The accommodation that is available, the grouping together of those at certain stages of self-help in dressing and cleanliness, or of boys who work together on the farm, are really matters of institutional convenience and need not enter into any general scheme of classification of cases. Chronological age is taken into account in its relation to mental level by the first division of the cases according to I. Q.s. All the rest of the factors mentioned enter into the question as to whether the person is well-adjusted or mal-adjusted within the institution. Previous home or institution training, social status, temperamental stability, are some of the main factors in good adjustment. Psychopathic or delinquent tendencies are the main factors in mal-adjustment. Hence we have sub-divided our cases into the well-adjusted and the mal-adjusted, and the latter into two groups, those with psychopathic and those with delinquent tendencies. Here again it is proper to explain that we have been very careful not to make a positive diagnosis of psychopathy, but merely to state the tendency when observable. In the same way it would not be fair to describe the cases with delinquent tendencies as being actually delinquents. Most of them, however, would be delinquent if given the opportunity to become so.

Wherever the groups are referred to as psychopathic or delinquent hereafter it should be remembered that these terms mean "with psychopathic or delinquent tendencies."

Table 1 shows the classification scheme and the numbers of cases in each group.

Children were allotted to the various groups only after very careful consideration of their behavior. In very many cases observation had extended over a number of years. This work of classification was carried out with the invalu-

able assistance of Mrs. Nash, who has a very intimate knowledge of the cases.

It should be explained that the term "mal-adjusted" has a retrospective application. Many of those with psychopathic tendencies may be at present well-adjusted, but only under special circumstances or conditions. For instance, one boy who has such a "tic" on automobiles that he stops in his walk at every curve or rise in the ground and goes through the motions of shifting gears with hands and feet, is happy and gives no trouble so long as he can work with simple machinery or is allowed to crank up the coal truck. The term "mal-adjusted" here means that his adjustment has been difficult in the past and he is at present well-adjusted only because of the special measures taken to indulge his peculiar obsession. Better terms to have used would possibly have been "difficult adjustment" and "easy adjustment."

By referring to Table 1 it will be seen that the total number of cases with I. Q.s below 75 is 377. The number of I. Q.s of 75 or above is 87. For the purpose of further classification we have redivided the cases at feeble-minded levels into those above and below 55 I. Q. The two groups of well-adjusted feeble-minded together total 242, or about 64% of the total at feeble-minded levels. Eighty-five, or a total of 22.5% of the group at feeble-minded levels, show psychopathic tendencies. Fifty, or about 13%, of the group have delinquent tendencies. Those at dull normal levels show the following percentages: Well-adjusted, 33.3%; psychopathic tendencies, 17.2%, and delinquent tendencies, 49.4%. It will be seen from these percentages that delinquency tends to be associated with the higher grades of defective mentality and with dull

TABLE 1.

CLASSIFICATION SCHEME.

SOCIAL INEFFICIENTS—464 CASES.

Below 75 I. Q. 377 Cases (At F. M. Levels)				75 I. Q. or Above. 87 Cases (At Dull Normal Levels)		
		Mal-Adjusted			Mal-Adjusted	
I. Q.	Well-Adjusted	Psychopathic Tendencies	Delinquent Tendencies	Well-Adjusted	Psychopathic Tendencies	Delinquent Tendencies
Below 55 I. Q.	171 cases	51 cases	15 cases	29 cases	15 cases	43 cases
I. Q. 55 and above	71 cases	34 cases	35 cases			

normal levels. The number of those with I. Q.s below 55 who show delinquent tendencies is very small—approximately 6.3%. The total at feeble-minded levels showing delinquent tendencies (13%) may be compared with the 49% at dull normal levels. This shows that it takes a certain amount of intelligence to get into serious mischief. With regard to the cases with psychopathic tendencies, however, the matter stands very differently. The percentage with psychopathic tendencies is approximately 21.5% of those below 55 I. Q., 24.2% of those above 55 I. Q., and 17.2% of those at dull normal levels. We may state these various tendencies by saying that the lower the mental age the greater the number of well-adjusted, the higher the mental age the more delinquents, whilst the incidence of psychopathy tends to be independent of mental level.

Considering the whole 464 cases examined, the approximate percentages for the various groups is as follows: Well-adjusted, 58%; with psychopathic tendencies, 21.5%; with delinquent tendencies, 20%. These figures give some indication as to the nature of the problem which an institution such as the Training School presents. In nearly 60% of the cases it is a problem of industrial and educational training, aiming at any development that contributes to happiness, self-management and self-support. For about 21% of cases the problem presents psychiatric aspects. For the psychopathic it is not only a matter of training, but also of mental conservation. This class of case needs great help and careful study in order to become properly adjusted. In cases of simple feeble-mindedness, work is provided as a means of training; for the psychopathic, work provides not only training but occupational therapy, without which the individual tends to degenerate and to become definitely

psychotic. Finally, about 20% of cases, because of their tendencies, present a problem in delinquency. It should be noted, however, that with better means of differentiating the dull normal from the feeble-minded, the relative percentage of delinquents would be very much diminished. Regarding only the cases who are at feeble-minded levels, the oft-quoted statement that every defective is a potential criminal loses much of its force, since only 13% of these cases show delinquent tendencies. This percentage is probably not much higher than would be found for an equal number of normal unselected cases of similar social grade. Of course, it may be true that a large number of our well-adjusted cases would become delinquent if left unguided in the community, but there is a surprising number who show quite normal moral stability and who would react to the ordinary safeguards of morality which society employs. It is certainly very far from the truth to say that all of these cases, if turned loose in the community, would show criminal tendencies. It is quite probable that the view that this class of defectives would in many circumstances become an active menace to society is very greatly exaggerated. As far as the protection of society is concerned the state need not provide institution care for all its defectives. Many defectives can be looked after perfectly well in their homes. As regards the stable type of defective the real argument for institutional care is that the defective can be made happier and more useful in the institution than in the average home. Training schools, not custodial institutions, are what is needed for this class of case. The courageous experiments of Dr. Bernstein at the Rome institution, New York, have shown that it is possible by means of a proper colony and parole system to socially rehabilitate large num-

bers of stable defectives. The really great menaces to society are the dull normal delinquent and the psychopathic groups. It is from these that society itself requires protection. It should be noted, however, that even the psychopathic are quite susceptible to discipline and social guidance within the institution. Considering the percentages of delinquent and psychopathic in institutions the number of untoward happenings is comparatively rare. It is sometimes very difficult indeed to differentiate between what shall be considered as delinquent and what psychopathic behavior. It is probably true that some of the delinquencies have a psychopathic basis. The only criterion which we can apply is that of motivation. If the action appears to proceed from normal motivation and is proportionate to the aims of the individual, then there is no reason for regarding such action as psychopathic. It is when the conduct is ill-founded or disproportionate in respect to motivation that we regard it as evidence of psychopathy. It may be advisable to summarize the characteristics that have been taken into account in this classification.

The feeble-minded, well-adjusted groups are those for whom the environment provided at the Training School is so suitable that they give no trouble as regards discipline and control. They differ most from the normal by having a restricted mental range. In all respects, with the exception of physical development, they are like children who never grow up. In other words, they are dependent upon others for impulse and direction, are easily suggestible, may be somewhat cunning, are excitable and obtrusive, but in a harmless way, and in most respects are immature, or, if the parallel be not carried too far, resemble the adults of primitive races. The Australian aborigine, for instance, shows a

similar easy stimulability of laughter and the simpler emotions, loves to display bright colors, and is extremely suggestible. The stable feeble-minded, though of sub-normal intelligence, function normally in a decidedly simplified environment, consequently their relation to normality may be represented as a very small circle drawn within a large one, as in Figure 2.

The psychopathic child, however, differs markedly from the stable feeble-minded in almost every respect except in mental level. No predictions as to the social, industrial or educational capacity of subnormal children which are founded on mental age alone, would have any great degree of reliability unless the psychopathic are excluded. The psychopathic type have been excellently described in an article in a recent issue of the Training School Bulletin entitled, "Report on the Study of the Psychopathic Child," by Minnie B. Lente. The author repeats descriptions that were given by certain eminent psychiatrists in response to a questionnaire. With regard to the question, "Will you briefly define what is meant by the psychopathic child," the article quotes the following summary of answers as being particularly pertinent.

"We gathered that there are various psychopathic types, that they are essentially mal-adjusted children whose energy is being used in unconstructive ways, and whose trouble is expressed mainly in an abnormality in character and in the intensity of their emotional and volitional reactions." (Dr. G. H. Kirby). "These abnormalities may give rise to conduct disorders, nervousness in various forms and even actual irrationality." (Dr. John T. McCurdy.) "Furthermore, these children are of a type unusually sensitive in make-up, or of a temperament of a kind which tends to make adjust-

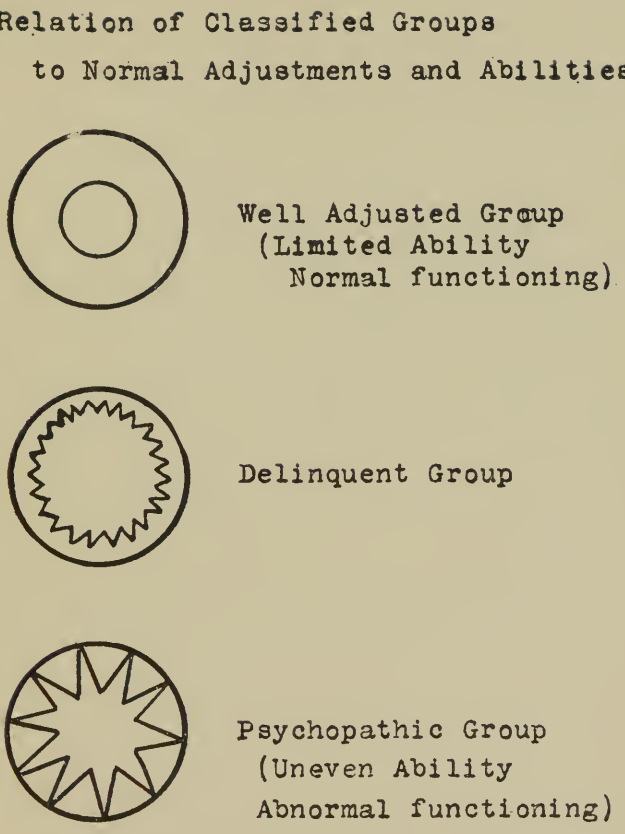


Fig. 2. Relation of Well-adjusted Psychopathic, Delinquent and Feeble-minded to Normality.

ment to reality, to society, to convention and ordinary routine so difficult that persistent failure characterizes their attempts at adjustment." (Dr. Jessie Taft.) One psychiatrist says, "The adaptive difficulties of these children are the expression of mental attitudes, trends and twists which constitute a very marked departure from normal mental health." (Dr. V. V. Anderson.)

Dr. Anderson, who recently conducted a survey of these children in one of our states, classifies them as follows: "The very thin, under-nourished, over-active, restless, neurotic, emotional, violent-tempered child, the apathetic, weak-willed, physically inert, sluggish, over-suggestible, inadequate child, or the egocentric, selfish, egoistic, unappreciative, cruel, ungrateful, individualistic child; the shut-in, the timid, hypersensitive child with feelings of inferiority; and many other types with psychopathic traits that seriously handicap them in adapting themselves to their environment."

All of these types are to be found amongst the children with psychopathic tendencies at the Training School. From the psychological point of view, they very often show marked irregularities in mental development. Very many cases have special aptitudes such as remarkable rote memory. However, their interests are so one-sided and restricted in range that the promise of their mental level is rarely justified by performance. Their test results sometimes show unexpected abilities and failures much below their general level of intelligence. Further reference will be made in later sections to the physical and mental characteristics of our cases with psychopathic tendencies. Their relation to normality can best be represented by an irregular star shape within a larger circle (Figure 2). In other words, their

abilities may touch the levels of normality in certain directions, but their essential feature is an abnormality or lack of stability in habits, interests, judgment, attitudes and abilities. The children with delinquent tendencies, by taking some of the characteristics of both the psychopathic and the ordinary feeble-minded type, may be said to occupy a midway position. This means that some of their delinquencies have a psychopathic basis. On the other hand, there is a number of the simple feeble-minded who become delinquent because of certain environmental factors. These factors are just as potent causes of crime as in the normal population. Lack of early moral training, evil examples and companionship, lack of home control, broken homes—these have much weight in making a defective delinquent. It has been pointed out that the tendency to delinquency increases in the higher mental levels, and we found that many of these children have lacked the average conditions of home control and parental supervision.

The relation of delinquency to normality may be well represented by the third diagram of Figure 2, which shows an irregularity of outline, but on the whole a more even relation to normality than the diagram representing the psychopathic case.

As before noted, we are very careful to use the term "psychopathic tendencies," rather than to make actual diagnoses of psychopathy. The question of the treatment and training of these cases is an interesting one. In this connection it may be noted that the simpler forms of psychopathic behavior may be well taken care of in an institution for feeble-minded, provided that special measures are taken for the handling of such cases. Certain types of those with psychopathic tendencies may with advantage be segregated

from the rest of the cases. On the other hand, other cases appear not to benefit by too close association with others of the same or different psychopathic types. A small number of these can be easily absorbed amongst the general population of the institution.

The same remarks hold good with regard to the children with delinquent tendencies. Many of these have not had any opportunity to become really delinquent, but their habits are such that we know they would soon become delinquent if dismissed from the care of the institution. We have found it necessary to segregate children of this type from the rest of the school pupils. As in the case of the psychopathic, a certain number can be looked after very well in groups of the ordinary feeble-minded. Those, however, who are of dull normal mental levels could with great advantage be dealt with in other institutions. Hence, the importance of more accurate diagnosis than obtains at present.

CHAPTER III

ANTHROPOMETRIC STUDIES

NORMAL BRAIN CAPACITY

In 1916 the writer, in conjunction with Dr. R. J. A. Berry, Professor of Anatomy in the University of Melbourne, began an extensive investigation into the relationship between brain capacity and intelligence. Previous to this time an investigation on the accuracy of several formulae that had been used for calculating the capacity of the cranium by outside head measurements had been carried out by Dr. J. W. Anderson[1] at the same University. His method was to measure the heads of subjects who came into the dissection room of the Anatomy Department and then, by dividing the heads transversely, leaving all the tissues except the brain contents in position, to take a water measurement of the upper and lower halves of the divided crania. By comparing the actual with the calculated capacity, Anderson found, in a series of 40 cases, that Lee's formula number 14 gave the least average error. Taking his results I have calculated the differences and find that the average error in the calculated measurements is about 6½ per cent.

The formula eventually adopted by Berry and Porteus was that given for males by Lee[2] (L—11mm.) (B—11mm.) (H—11mm.) .000337+406c.c., where L is the maximum antero-posterior length, B is the maximum breadth

[1] "An Investigation as to the Most Accurate Method of Estimating the Cubic Capacity of the Living Head, Together with some Remarks on the Relative Thickness of the Cranial Integuments." By John H. Anderson, M.B., Ch.B. (Melb.) J. of Roy. Anthrop, Inst. July 1910.

[2] "Data for the Problem of Evolution in Man." By A. Lee. Phil. Trans., A, vol. 196, 1901.

and H is the auriculo-bregmatic height. The deduction of 11mm. from each measurement is in allowance for the thickness of the skull and soft parts of the scalp.

Subsequent observations by the present writer, using the water displacement of the brain when removed from the skull, tend to confirm Anderson's results and to show that the average error is probably not larger than 6 per cent. Admittedly this is a considerable error, but apparently this is the best formula available. Berry and Porteus, from their observations, also concluded that the male formula was applicable to females without greatly increasing the average error. Accordingly this formula was used for all cases.

The instrument used for taking the measurements of maximum length and maximum breadth was a Flowers calipers. The instrument used for measuring head height was a modification by Porteus of Gray's radiometer. The instrument as used at Vineland is pictured in Fig. 3, and may be obtained from Stoelting & Co., Chicago.

The method of taking the measurements adopted by the authors is described in the following excerpt from the Berry-Porteus monograph[1]:

"1. MAXIMUM HEAD LENGTH. Measured from the most prominent point of the glabella to the most distant point in the middle line on the back of the head, known as the occipital point. The observer stands on the left side of the person being measured and the fixed point of the calipers is first applied to the glabella, and held there by the fingers of the left hand, while the other point is moved over the midline of the back of the head (occiput). Care must be taken to observe that the fixed point has not been moved off the glabella during the measurement, and that the

[1]Intelligence and Social Valuation. By R. J. A. Berry and S. D. Porteus. Research Publication No. 20. Training School, Vineland, 1920.

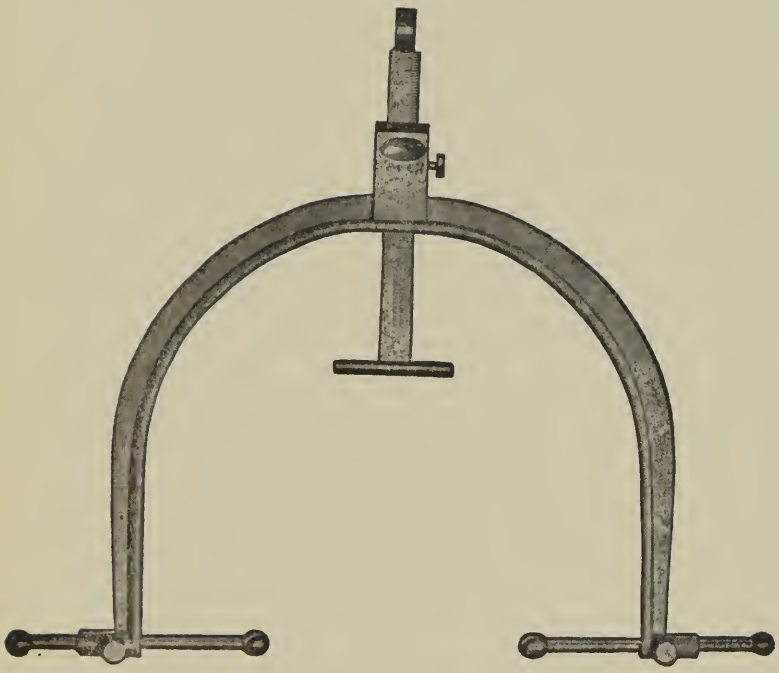


Fig. 3. Radiometer for Measuring Head Height Adapted by Porteus from Gray's Radiometer.

points of the calipers have not been deflected from the median vertical plane. The pressure of the points of the calipers on the head should be as much as can be comfortably borne by the person under examination. This diameter is recorded by means of Flower's calipers.

"2. MAXIMUM HEAD BREADTH. Measured wherever it can be found above the plane of the ear holes. The calipers should be held in a vertical transverse plane and moved about until the maximum diameter is ascertained, the observer being careful to keep the points of the calipers exactly opposite to one another. The pressure of the points on the head should be as much as can be comfortably borne by the person under examination. This diameter is recorded by means of Flower's calipers.

"3. HEAD HEIGHT. Measure from the mid-points of the ear holes to the highest point of the cranium measured in a vertical plane when the eyes are directed to the horizon. This diameter is measured by means of Gray's, or other radiometer.

"Although the method of recording the head measurements appears so simple that it may be acquired by any layman in a few minutes, there are certain pitfalls against which the tyro should be warned. Amongst these is the pressure to be employed. If the pressure of the points of the calipers on the individual's head be insufficient, too high a reading will be obtained, and if it be unduly severe, too low a reading will be recorded. As stated in the official instructions just quoted, the pressure 'should be as much as can comfortably be borne by the person under examination.' If there be any doubt about the measurements, the reading should be recorded three times and the average taken as the correct one. With these simple precautions two

observers should not differ from each other by more than one millimeter for head lengths and head breadths.

"As regards height, it is absolutely essential for the correct procedure to be employed. It is the most important of the diameters for the future calculation of the cubic capacity of brain, and errors in its reading may seriously affect the calculations. The individual should be directed to look straight ahead of him so that his line of sight is parallel with the ground. If this be not done, the head will tend to fall forward or backward, and sources of error are immediately introduced. As regards the pressure to be employed, it must be firm without hurting or dragging on the ear-holes. In the introduction of the ear-rods of the radiometer into ear-holes, care must be taken not to force the instrument into the latter, otherwise there is a risk of damaging the delicate ear-drums or membranae tympani. This source of danger may, however, be eliminated by getting the individual himself to introduce the ear-rods into the ear-holes while the observer supports the instrument. Lastly must be remembered the possibility of a careless reading of the instrument."

In order to discover the importance of individual differences the authors had first to establish norms. This was done by the measurement of upwards of 9000 cases varying in age from 5 to 30 years. The males measured numbered 6700, the females 2717. The cases included children from primary schools, preparatory colleges and students of the Melbourne University. In addition to these, smaller groups of indigent adults, deaf and dumb, feeble-minded and delinquents were also measured. Added interest was given to the investigation by the inclusion of the capacities of a group of Australian aboriginals.

It was found that the average brain capacity at twenty years of the University student (using Lee's male formula) was 1483 cub. cent. Evidence was forthcoming to show that brain growth in the educated classes did not cease until some period between the twentieth and thirtieth years of life. By comparing the means of brain capacity from 13 years onward to 20 years, it was found that the average annual increment of brain capacity was about 21c.c. for males. For the five-year period preceding this, i. e., from the ninth to the fourteenth year, the total increase is approximately 63 c.c., an average annual increment of about 12 c.c. These figures show that brain growth parallels the general bodily development, the post-pubescent period being apparently one of an important and rapid development of the brain as well as of general bodily weight and height.

With girls the case stands rather differently, the post-pubescent period (14th to 20th year), yielding an increase of only 63c.c. or 10.5c.c. annually. From the 9th to the 14th year the total increase is 98c.c., an annual average increment of nearly 20c.c. Apparently the period from the 12th to the 14th year is, in girls, one of rapid brain growth. These figures are taken from the table of measurements calculated with the female formula, but the relative increase remains the same as if the male formula were used.

The average brain capacity of 217 adult paupers was 1440c.c., which is 43c.c. less than the student's average, or the equivalent of at least two years of normal male growth. Stated in terms of age, these cases had a brain capacity equal to the normal 17-year level.

The Australian aboriginal adults had an average of 1347c.c., which is about the level of the 12-year-old normal white boy. A group of 53 deaf and dumb boys whose

average age was 12 years had an average capacity of 1307c.c., which is a little above the normal 9-year level, or the equivalent of about three years' retardation.

To complete the comparison of average brain capacities a group of 39 mentally deficient boys was measured. Their average chronological age was 12 years and their average brain capacity was 1292c.c., which is equivalent to the normal average at 8½ years. Stated in terms of years of average development it may be said that their deficiency was equivalent to about four years' retardation in development. The group was small but the figures presented some indications that the arrest of mental development was reflected in diminished brain growth. As compared with the 53 deaf and dumb boys of equal average age, the deficients showed a smaller capacity although it was evident that the sense deprivation in the deaf had a decidedly marked effect in diminishing brain volume.

The next step in the investigation was an attempt to discover the significance of individual deficiencies in brain capacity in relation to intelligence. The authors therefore arranged the measurements in the form of percentile tables. These tables of course admit not only of a comparison of an individual's capacity with the median of his age group but also enable us to determine the percentage of cases who have less capacity. These tables were published in the previously mentioned monograph. The tables that are referred to in the text are reproduced in this volume.

Because of the various sources of error in calculating brain capacity from head measurements the authors decided to set wide limits to what they should consider normal capacity. It was determined to regard only the measurements below the 10 percentile and above the 90 percentile as

TABLE 2

TABLE OF THE HEAD FORM OF 2097 VICTORIAN PUBLIC SCHOOL BOYS AND MELBOURNE UNIVERSITY STUDENTS.

Year of Life.	Mean of Length.	Probable Error.	Standard Deviation of Length.	Probable Error.	Mean of Breadth.	Probable Error.	Standard Deviation of Breadth.	Probable Error.	Mean of Height.	Probable Error.	Standard Deviation of Height.	Probable Error.	Cubic Capacity of Brain as Calculated from Head Measurements.	Number of Cases.
7th 8th 9th	182.66	.43	5.16	.31	145.20	.35	4.19	.25	125.68	.35	4.14	.22	1296	63
10th	183.81	.32	4.45	.23	144.71	.34	4.74	.24	126.11	.29	3.97	.20	1302	85
11th	184.03	.31	4.63	.22	145.62	.26	3.95	.19	126.85	.27	4.09	.19	1315	98
12th	184.44	.37	5.76	.26	146.69	.29	4.63	.21	127.11	.31	4.83	.22	1326	109
13th	186.59	.33	6.09	.23	147.14	.26	4.81	.18	128.13	.25	4.69	.18	1350	153
14th	186.48	.25	5.68	.18	147.77	.25	5.62	.18	128.71	.22	4.97	.15	1358	223
15th	187.57	.25	6.32	.18	148.87	.20	5.13	.14	129.35	.20	4.97	.14	1377	275
16th	188.76	.21	5.80	.15	149.86	.17	4.56	.12	130.58	.17	4.73	.12	1401	326
17th	190.02	.23	6.15	.16	150.66	.17	4.44	.12	131.44	.18	4.92	.13	1421	312
18th	191.50	.30	6.47	.21	151.71	.22	4.71	.15	132.38	.23	4.82	.16	1445	200
19th	192.44	.39	6.14	.27	152.09	.30	4.81	.21	133.37	.23	3.63	.16	1462	111
20th-30th	193.73	.33	5.84	.23	152.49	.26	4.69	.18	134.55	.29	5.22	.20	1482	142
												Total		2097

TABLE 3

TABLE OF PERCENTILES OF 2104 VICTORIAN PUBLIC SCHOOL BOYS AND MELBOURNE UNIVERSITY STUDENTS.

Range of Percentiles.	7th, 8th and 9th Years of Life.	10th Year of Life.	11th Year of Life.	12th Year of Life.	13th Year of Life.	14th Year of Life.	15th Year of Life.	16th Year of Life.	17th Year of Life.	18th Year of Life.	19th Year of Life.	20th to 30th Years of Life.
0	1160	1124	1194	1158	1166	1162	1135	1127	1225	1145	1182	1272
10	1206	1222	1239	1224	1263	1255	1265	1307	1320	1350	1381	1370
20	1227	1256	1265	1255	1293	1292	1308	1336	1356	1380	1403	1411
30	1257	1269	1279	1278	1312	1318	1330	1360	1386	1403	1427	1442
40	1264	1295	1293	1295	1323	1338	1352	1382	1401	1423	1448	1463
50	1282	1304	1315	1323	1338	1357	1377	1404	1415	1448	1466	1481
60	1297	1316	1333	1349	1362	1373	1398	1425	1434	1467	1483	1509
70	1333	1326	1354	1360	1382	1391	1426	1452	1459	1486	1495	1528
80	1344	1345	1378	1387	1417	1412	1460	1477	1483	1520	1520	1553
90	1380	1372	1399	1428	1447	1455	1487	1507	1522	1551	1551	1589
100	1480	1504	1489	1593	1539	1690	1608	1593	1655	1653	1637	1669

deviating markedly from the normal. 200 individuals with measurements outside these limits were then examined by Porteus using as a measure of intelligence the average of Binet and Porteus test ages. All those with average I. Q.s. below 75 were considered to be "at feeble-minded levels of mentality." Those with average I. Qs. between 75 and 85 were considered to be distinctly dull. Those with average I. Qs. above 125 were called "super-intelligent" whilst those with I. Qs. between 115 and 125 were considered to be distinctly above average. It will be seen that a very wide range of I. Q. limits—from 85 to 115—was taken to represent normality. Even with this large allowance the number of very large and very small headed children outside these limits was extremely large. The percentage distribution in relation to mental levels was as follows:

A. Microcephalic Group (below the 10 percentile)	
At feeble-minded levels	18.5%
Distinctly dull	32.0%
Total subnormal cases	50.5%
Super-intelligent	1.25%
Distinctly above average	2.75%
Total above average intelligence	4.0 %
B. Macrocephalic Group (above the 90 percentile)	
At feeble-minded levels	5.0 %
Distinctly dull	9.0 %
Total subnormal cases	14.0 %
Super-intelligent	9.0 %
Distinctly above average	16.0 %
Total above average intelligence	25.0 %

We may state these results in terms of probability. We

may say that if a child has a brain capacity below the normal percentile the chances are about even that he will be distinctly below average in intelligence levels. Since only 4 per cent. of the 100 microcephalic children examined were above 115 I. Q., we may say that the chances against a child with brain capacity below the 10 percentile being distinctly above average in intelligence are 25 to 1.

The chances against a child with brain capacity above our 90 percentile being subnormal in intelligence are about 7 to 1; of being distinctly above the average are about 4 to 1.

The investigations mentioned above have been supplemented by various researches carried on during the past three years by the Vineland staff. In a study of female recidivists at Sleighton Farm, Pennsylvania, Miss Marjorie Babcock, research assistant in the Vineland laboratory, measured the heads of girls whose average age was 16½ years. Their average was about 1305c.c., which is, according to the Berry-Porteus tables, a little less than the median for girls 14 years of age. Hence, the extent of their retardation in brain development may be stated at 2½ years. Some of this difference may be due to differences in social grade between this group and the girls included in the tables. Figures are not available for females to determine the importance of this factor, but for boys the difference due to social grade at 13 years of age amounted to 27c.c., which is somewhat over a year's annual increment of growth at about this age. The correlation between the brain capacity of these recidivists and Porteus test age was .31. The girls were mainly sex offenders and were of a higher type than the criminals examined in the investigation previously referred to.

TABLE 4

TABLE OF PERCENTILES OF BRAIN CAPACITY OF 2717 VICTORIAN PUBLIC SCHOOL AND STATE SCHOOL GIRLS AND MELBOURNE UNIVERSITY WOMEN STUDENTS. CALCULATED FROM LEE'S MALE FORMULA, No. 14.

	7th.	8th.	9th.	10th.	11th.	12th.	13th.	14th.	15th.	16th.	17th.	18th.	19th.	20-30 Year.
0	1054	1044	1070	1118	1080	1077	1100	1097	1161	1141	1126	1151	1178	1192
10	1118	1136	1130	1160	1165	1167	1202	1214	1236	1235	1233	1244	1264	1253
20	1137	1158	1155	1185	1195	1193	1233	1247	1254	1269	1266	1265	1289	1289
30	1155	1169	1182	1213	1213	1218	1242	1269	1270	1291	1294	1286	1310	1322
40	1177	1195	1201	1225	1237	1246	1268	1283	1290	1307	1311	1303	1326	1333
50	1193	1207	1230	1239	1255	1263	1290	1298	1308	1326	1328	1328	1349	1351
60	1209	1221	1240	1259	1266	1278	1306	1324	1332	1345	1348	1347	1374	1368
70	1230	1237	1258	1267	1281	1303	1326	1339	1358	1362	1363	1371	1381	1380
80	1251	1251	1271	1287	1324	1335	1348	1355	1382	1383	1393	1406	1408	1405
90	1284	1279	1302	1309	1368	1381	1384	1387	1428	1427	1425	1436	1427	1453
100	1378	1367	1442	1542	1502	1473	1508	1534	1526	1588	1542	1598	1575	1606

TABLE 5

TABLE OF THE HEAD FORM OF 2717 VICTORIAN PUBLIC SCHOOL GIRLS, STATE SCHOOL GIRLS AND MELBOURNE UNIVERSITY STUDENTS

Year of Life.	Number of Cases	Mean of Length.	Probable Error.	Standard Deviation of Length.	Probable Error.	Mean of Breadth.	Probable Error.	Standard Deviation of Breadth.	Probable Error.	Mean of Height.	Probable Error.	Standard Deviation of Height.	Probable Error.
7th.	56	173.91	.47	5.29	.33	137.66	.34	3.87	.24	124.47	.38	4.24	.27
8th.	81	175.49	.40	5.38	.28	139.11	.28	3.74	.19	124.10	.35	4.69	.24
9th.	97	175.48	.38	5.56	.26	139.91	.30	4.47	.21	124.90	.35	5.19	.25
10th.	142	177.58	.30	5.38	.21	140.39	.24	4.24	.17	125.94	.24	4.24	.17
11th.	169	178.48	.29	5.74	.21	141.22	.22	4.35	.16	126.50	.29	5.74	.21
12th.	155	179.55	.32	6.00	.23	141.66	.26	4.79	.18	126.48	.26	4.79	.18
13th.	202	180.14	.27	5.74	.19	142.68	.24	5.19	.17	127.98	.20	4.35	.14
14th.	255	182.40	.24	5.74	.17	142.57	.18	4.35	.13	128.77	.19	4.58	.13
15th.	370	182.95	.19	5.66	.14	143.78	.15	4.41	.10	129.57	.17	4.87	.12
16th.	413	183.62	.17	5.88	.13	144.41	.14	4.24	.09	129.99	.13	4.58	.10
17th.	335	183.88	.21	5.74	.15	144.53	.16	4.35	.11	129.80	.17	4.79	.12
18th.	184	184.33	.29	5.83	.20	144.72	.24	5.00	.17	129.72	.22	4.58	.16
19th.	95	184.14	.37	5.37	.26	145.86	.28	4.12	.20	130.33	.31	4.47	.21
20-30.	163	185.01	.27	5.29	.19	145.70	.25	4.89	.18	131.23	.26	5.00	.18

In 1919 the results of a preliminary investigation into the brain capacity of feeble-minded were published.[1] This study of 50 unselected cases showed that about 36 per cent. of the cases had brain capacities below the normal percentile; 14 per cent. had brain capacities above the ninety percentile, so that 50 per cent. of this group were in the extreme deciles. There may, however, be other indications of abnormality besides deviations in brain capacity. Abnormality of head form may also be associated with mental inferiority.

The single measurements of head length, head breadth and head height of the defectives were therefore compared with the measurements of normals of equal ages. Because of the great variability of these diameters it was determined to set very wide limits of normality. Only those who had one or more of the head diameters differing more than twice the normal standard deviation from the average of their age were considered abnormal. Fifty-six per cent. of the defectives had some single measurements differing from the normal by more than twice the normal standard deviation; 10 per cent. of these did not have extreme capacities, and hence were not included in the 50 per cent. included in the extreme deciles.

The cranial indices were similarly considered. The length-breadth, length-height and breadth-height indices of this group of feeble-minded were compared with the normal averages of individuals of the same ages and racial origins. A range of 5 points above or below this racial average was taken as the limits of normality and 12 per cent. of cases not included under the other abnormal categories were found to be outside these limits. In all, marked abnormalities either in capacity, in single measurements, or in cranial

[1] "Cephalometry of Feeble-minded." By S. D. Porteus. Research Publication No. 16. Vineland laboratory.

indices were observed in 72 per cent. of this group. This study confirmed the statement by Berry and Porteus that marked deviations from normal cerebral development tended to be associated with mental abnormality.

BRAIN CAPACITY AND MENTAL DEVIATIONS.

The present investigation deals with 464 cases, and, because of the larger numbers and the division of cases into groups, has much greater significance.

TABLE 6

AVERAGE BRAIN CAPACITIES OF FEEBLE-MINDED.

464 Cases.

Group	No. Boys	Average Cap.	No. Girls	Average Cap.
Well Adjusted below 55 I. Q.	131	1258 c. c.	40	1209 c. c.
Well Adjusted above 55 I. Q.	56	1273 c. c.	15	1205 c. c.
Psychopathic below 55 I. Q.	43	1371 c. c.	8	1221 c. c.
Psychopathic above 55 I. Q.	29	1401 c. c.	5	1267 c. c.
Delinquent	42	1327 c. c.	8	1225 c. c.
Dull Normal Well Adjusted	18	1338 c. c.	11	1256 c. c.
Dull Normal Psychopathic	12	1455 c. c.	3	1325 c. c.
Dull Normal Delinquent	31	1305 c. c.	12	1306 c. c.

The average capacities of the various groups are given in Table 6. The number of girls was small, but the same general tendencies are observable in their case as with boys.

Confining the discussion to boys, we would point out that the higher the group is in mental level the higher the brain capacity, provided the comparison is made separately for the well-adjusted or the psychopathic. Those of the well-adjusted who are below 55 I. Q. have the least average brain capacity and those between 55 and 75 I. Q.'s less than those at dull normal levels. Judged by these averages there is apparently a decided relation between intelligence and brain capacity.

Comparing the psychopathic, however, with the well-adjusted, we find marked differences. The well-adjusted below 55 I. Q. have no less than 113c.c. less average brain capacity than the psychopathic of like mental levels. In other words this well-adjusted group may be regarded as sub-evoluted but functioning normally in relation to their cerebral development, the psychopathic as the abnormally functioning but nearer normal as regards their brain capacity. The psychopathic above 55 I. Q. have an average advantage of 128c.c. over the well-adjusted of similar mental level, whilst the psychopathic at dull normal levels are 117c.c. above the average of the well-adjusted dull normals. The importance of these differences from the standpoint of brain growth may be gauged from the fact that 1258c.c.,—the average of the well-adjusted group below 55 I. Q.—equals the normal median for 7½ years. 1371c.c. the figure for the corresponding psychopathic group is little less than the median for 14 years—a difference in normal development level of 6½ years with, however, no difference in mentality level between the two groups.

The dull normal, well-adjusted group equal in brain capacity the median capacity for normals for 12 years. The average of the corresponding psychopathic group is equal to the normal median at 17½ years—a difference in development level of 5½ years. The well-adjusted above 55 I. Q. are at a normal 9-year level; the psychopathic group of similar I. Q.s are at a 15-year level—again a difference of 6 years. These differences are not accountable for by differences in the chronological ages of the two groups. The average age of the dull normal well-adjusted was 18 years, of the psychopathic 19 years. We may state the deficiency in brain capacity of each group in terms of normal growth by saying that the dull normal well-adjusted group were, on the average, 6 years retarded, the psychopathic only 1½ years.

These differences are too great and too constant in the various groups to be due to chance. It is quite evident that, as regards gross brain capacity, psychopathy is built up on a normal basis. In other words, brain growth and development have gone on in the psychopathic at such a normal rate that the dull normal psychopathic group are in average capacity little below the University students of equal age. Hence whilst feeble-mindedness or dullness unassociated with conduct disorders is due very largely to factors making for arrest of brain development, this is not the case with psychopathy. At the same time lower mental development is associated even in the psychopathic with lessened brain capacity, but to a much less marked extent than in the well-adjusted. Physically there is a different basis for each condition—hence the importance of the recognition of psychopathic tendencies and their careful classification in any investigation regarding etiology.

The delinquents it will be seen, stand about midway, as regards brain capacity, between the well-adjusted and psychopathic groups. The feeble-minded delinquent group stand above the well-adjusted with I. Q.s above 55, but decidedly below the psychopathic group. As regards the dull normal group, the delinquents are below the well-adjusted in average capacity, but this is due to the fact that the latter are the older group. They average 18 years, whilst the delinquent group averages only 12.8 years. In comparison with chronological age the delinquent group are above the well-adjusted. The latter are 6 years retarded in brain development, whilst the delinquents, in comparison with their age, are only 3 years retarded.

The percentile distribution in percentages gives us another method of comparison between the various groups. The figures are given in Tables 7 and 8, the method being to compare each individual's capacity with the normal percentile. As girls are compared with girls the figures for all cases can be combined.

The advantage of presenting the results in this way lies in the fact that comparisons can be made between the groups at ten points in the distribution. In both tables percentages are given. It should be remembered that a normal distribution would give 10 per cent. of cases within the limits of each decile.

Examining the tables we find that the percentages of cases below the normal ten percentile in brain capacity vary considerably for the various groups. No less than 59 per cent. of the well-adjusted group below 55 I. Q. have brain capacities outside this lower limit, a percentage six times greater than the normal expectation. In all, 71 per cent. are below the 20 percentile. The great extent to which

TABLE 7.

DISTRIBUTION OF BRAIN CAPACITY PERCENTILES.

Feeble-Minded Groups.

Percentiles	Well Adj. — 55	Well Adj. +55	Psychopathic — 55	Psychopathic +55	Delinquent +55
0 - 10	59%	46%	20%	20%	44%
11 - 20	12%	18%	13%	15%	20%
21 - 30	4%	8%	13%	12%	7%
31 - 40	5%	5%	6%	6%	2%
41 - 50	5%	7%	8%	6%	4%
51 - 60	4%	4%	8%	3%	4%
61 - 70	2%	3%	8%	9%	2%
71 - 80	3%	1%	8%	15%	7%
81 - 90	3%	1%	8%	9%	2%
91 - 100	4%	7%	8%	6%	7%

TABLE 8

DISTRIBUTION OF BRAIN CAPACITY PERCENTILES

Dull Normal Groups.

Percentiles	Dull Normal Well Adj.	Dull Normal Mal. Adj. Psychopathic	Dull Normal Delinquent
0 - 10	29%	7%	24%
11 - 20	19%	4%	5%
21 - 30	10%	1%	14%
31 - 40	6%	13%	10%
41 - 50	6%	7%	12%
51 - 60	3%	7%	7%
61 - 70	13%	13%	5%
71 - 80	0	7%	12%
81 - 90	3%	13%	10%
91 - 100	10%	27%	0

mentality at these low levels is associated with small brain development may be gauged by these figures.

For the next group—the well-adjusted above 55 I. Q.—the percentage below the normal 10 percentile is reduced to 46 and the percentage below the 20 percentile to 64 per cent.; of the dull normal well-adjusted group only 29 per cent. are below the normal 10 percentile and 48 per cent. below the 20 percentile. 44 per cent. of the feeble-minded delinquent group are below the 10 percentile, as compared with 24 per cent. of the dull normal delinquents. It is evident from these figures that for these groups there is a marked relation between mental level and the number of microcephalic cases.

The feeble-minded psychopathic group, however, does not show this relation in as marked a way. The same percentage (20%) is found in the group above 55, as below 55 I. Q. As regards the dull normal the distribution is very irregular showing the tendency of psychopathic characteristics in many cases to be associated rather with brain capacities above average than below—40 per cent. of this group having capacities above the normal 80 percentile.

We may also compare for each group the percentages above and below the normal median. 85 per cent. of the well-adjusted below 55 I. Q.; 84 per cent. of those above 55 I. Q., and 70 per cent. of the dull normal well-adjusted are below the normal median, or 50 percentile. For the three corresponding psychopathic groups the percentages are 60, 59 and 32 per cent. The two delinquent groups have 77 and 65 per cent. below the normal median. These comparisons show again that the psychopathic differ very much from the stable type in respect to brain development. The delinquents stand midway, their position being probably due to the fact that many delinquencies have an unrecognized psychopathic basis.

In consideration of the problem as to what extent mental deviations are associated with cerebral abnormalities, we may also take account of the form of the head as indicated either by single measurements or cranial indices. Taking, as before, the limits of normality as being equal to twice the standard deviation on each side of the average, we may pick out of each group those with one or more single measurements deviating to this extent. Of the well-adjusted group of lowest mentality we find that 79 per cent. are outside these very wide limits in respect to one or more of the three head diameters taken.

From the remaining cases we have picked out those with any one of the three cranial indices differing more than 5 points from their racial average, and also with abnormal brain capacities. These are additional to those included in the 79 per cent. with abnormal single measurements. These additional cases make up 4 per cent. of the total. Hence, we may say that 83 per cent. of this group show marked deviations from the normal either in brain capacity or head form. This percentage may be compared with that for the dull normal well-adjusted group, 55 per cent. of whom showed abnormalities of form or capacity. The psychopathic show smaller percentages of abnormality, both as regards single measurements or total abnormalities and the delinquent group again occupy a middle position. The figures for each group are given in Table 9.

As regards cranial indices there is some evidence to show that whilst psychopathy does not tend to be associated so much with inferior brain capacity it is associated with abnormalities of head form. This may be seen by reference to the last column of the table. In order to obtain these figures we excluded all children who were not apparently of Anglo-Saxon parentage. The three cranial indices for other races were not available for comparison. The psychopathic groups it will be noticed showed the largest relative percentages of abnormal cranial indices.

Summing up these results we may say that for the well-adjusted groups there is a decided relation between the size of head and intelligence. The lower the mental level the lower the average capacity and the greater the percentage of extreme deviations either in capacity or single measurements. The delinquent group show less marked tendencies in these respects. The psychopathic groups do not show the

same relation between brain capacity and mental level, their average capacities and distribution of percentiles approaching much nearer to the normal. On the other hand as regards the form of the head as expressed by cranial indices, the psychopathic show a greater percentage of marked deviations from the normal averages.

If we take only the cases who are at feeble-minded levels, the facts of brain capacity as indicated by head measurements may be considered of some diagnostic value provided the psychopathic are separated from this group. Better methods of detecting psychopathy and of differentiating the merely dull will undoubtedly clear the ground so that the significance of head measurements will be made more apparent. At present we are warranted in stating that a near-median or above median brain capacity, associated with a low mental level and a cranial index differing more than 5 points from the racial average are symptomatic of a psychopathic basis. The question of the relations of general physical development to psychopathy will be referred to later.

Interesting comparisons may also be made for the various groups by a consideration of the average lengths, breadths and heights in Table 10. Length of head and height of head increases with mental level somewhat regularly in the three well-adjusted groups. The average breadth of head for the two feeble-minded groups is the same. In head length, head breadth and head height the psychopathic, no matter at what mental level, excel all other groups. Particularly marked is their height of head. The dull normal psychopathic in this measurement are above the average normal adult of University grade. Here again the differences are too constant and too large to be due merely to chance.

TABLE 9

ABNORMALITIES OF HEAD MEASUREMENTS, CAPACITY AND CRANIAL INDICES

Group	Head Diameters +2 S. D.	Total Abnormal	Abnormal Cranial Indices
F. M. Well Adjusted below 55 I. Q.	79%	83%	31%
F. M. Well Adjusted above 55 I. Q.	69%	73%	24%
F. M. Psychopathic below 55 I. Q.	59%	70%	43%
F. M. Psychopathic above 55 I. Q.	50%	56%	26%
F. M. Delinquent	60%	68%	20%
Dull Normal Well Adjusted	48%	55%	19%
Dull Normal Psychopathic	33%	47%	26%
Dull Normal Delinquent	44%	53%	21%

NOTE: The figures in column 2 of the above table are obtained by comparing the three head diameters of the individuals with the normal averages as given in the Berry-Porteus monograph, "Intelligence and Social Valuation"; the figures in column 4 are obtained by comparison with the tables of normal cranial indices given by Porteus in "Cephalometry of Feebleminded" (P. 16).

Anthropological studies show that Nature has provided for the increasing complexity of the brain of civilized man mainly by an increase in height of head. This measurement, very often neglected in anthropometry, marks one of the chief differences between the prehistoric and the modern skull, between the skull of the primitive and the civilized man. It is also on the average a measurement in which there is considerable difference between the psychopathic and the well-adjusted of equal mental level.

TABLE 10

MEASUREMENTS OF HEAD LENGTH, BREADTH, AND HEIGHT

Group	Length	A. D.	Breadth	A. D.	Height	A. D.
Well-Adjusted below 55 I. Q.	177m.m.	8.7	141m.m.	6.2	125m.m.	5.4
Well-Adjusted above 55 I. Q.	181m.m.	5.6	141m.m.	5	126m.m.	4.4
Psychopathic below 55 I. Q.	183m.m.	7.1	148m.m.	4.6	130m.m.	3.7
Psychopathic above 55 I. Q.	186m.m.	6.4	146m.m.	5.3	131m.m.	4.9
Delinquent below 75 I. Q.	182m.m.	6.4	145m.m.	5.2	127m.m.	4.4
Well-Adjusted above 75 I. Q.	183m.m.	7.3	144m.m.	5.3	127m.m.	5.3
Psychopathic above 75 I. Q.	188m.m.	6.1	150m.m.	5.7	134m.m.	5.5
Delinquent below 75 I. Q.	182m.m.	5.1	144m.m.	4.2	129m.m.	3.4

Head length varies most in the well-adjusted of lowest mental level. This is probably due to the inclusion in this group of the Mongolians who are notably deficient in head length.

BRAIN CAPACITY AND HEREDITY.

Before leaving the subject of the brain capacity of feeble-minded it might be interesting to enquire as to the connection of heredity with inferior or abnormal development. We are able to present the facts for two small groups of cases. These children represent the cases whose heredity charts had been compiled under Dr. Goddard's direction and published by him[1] and who were still available for measurement. There were 45 cases who were classified by Dr. Goddard in three types,—hereditary, probably hereditary, and neuropathic ancestry. Their average brain capacity was 1335c.c. with an average deviation of 88c.c. The other group consisted of 20 cases whose condition was said to be caused by accident before or after birth or who were unclassified, the presumption in the latter case being that no hereditary factors were found. The average capacity of this group was 1385c.c. with an average deviation of 117c.c. Apparently the hereditary cases tended more towards cerebral sub-evolution, the non-hereditary to a greater range of deviations in capacity. Unfortunately our cases are too few to admit of more extensive comparisons. The distribution of the capacities is shown by two graphs.

In concluding this section on cranial measurements of defectives we wish to reiterate the importance of a proper

[1] "Feeble-mindedness. Its Causes and Consequences." By H. H. Goddard.

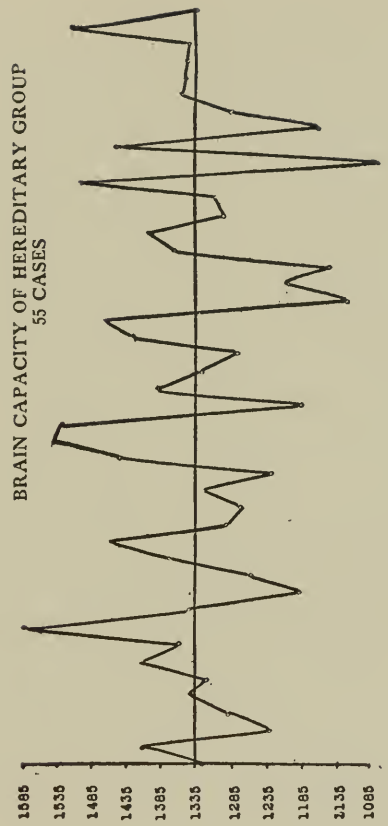


Fig. 4. Brain Capacities of Hereditary Group of Feeble-minded. 55 Cases.

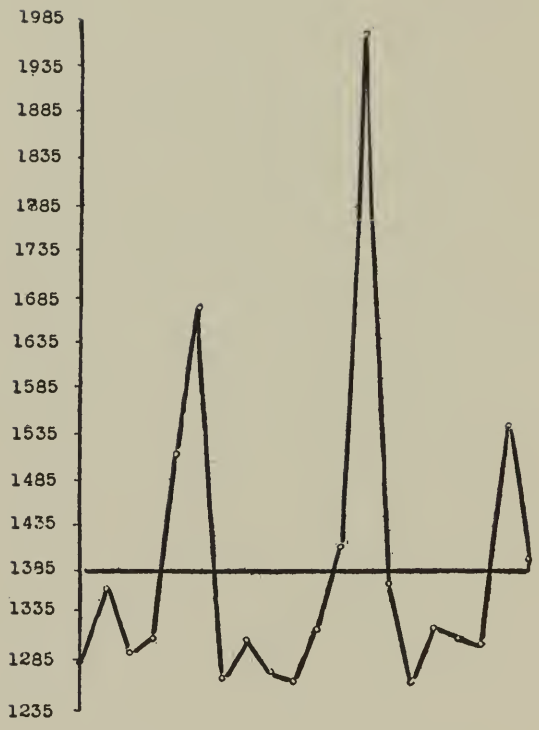


Fig. 5. Brain Capacities of Non-Hereditary Group of Feebleminded. 20 Cases.

examination and classification of cases in any investigation of cases subnormal in intelligence. When one considers that differences in behavior such as excitability, moodiness, impulsiveness, egocentric attitude and the like, are all that distinguish the conduct of the psychopathic from the well-adjusted and yet that there appear to be fundamental physical differences between the types, the value of observation and proper classification is seen. Conclusions founded on results obtained from the study of the subnormal *en masse* may be entirely invalidated by neglect of the observation of the behavior of the individuals not only in tests but in their social reactions as well.

BRAIN CAPACITY OF BLIND.

In view of the fact that sense deprivation in the deaf and dumb apparently causes a seriously diminished brain growth,[1] it was determined to obtain measurements of the blind. Mr. Burritt, Superintendent of the School for the Blind at Overbrook, Pennsylvania, very kindly offered us the opportunity and assistance to do this work. Miss Bertha Flowers, research assistant at the Vineland laboratory, accordingly obtained measurements of 143 cases, 64 girls and 79 boys, ranging in age from 8 to 28 years. The average age of the girls was 14 years 4 months and of the boys 14 years 1 month. The average brain capacity of the girls was 1266c.c. and of the boys 1340c.c. Compared with the normal 14 year old median, the girls are 42c.c. below, the boys 37c.c. below seeing persons. The girls' average corresponds with the normal girls' median at 11 years so that their deficiency in development is equal to slightly over 3 years of normal brain growth. The boys'

[1] See Chapter III, P.

average equals about the normal 12 year median so that their deficiency is about 2 years of normal development. These figures appear to show a more serious deficiency in the blind girl than in the boy. We therefore determined to divide both boys and girls into two groups—those below and those above 14 years—and extend the comparisons of averages further, 14 years being taken as being about the probable lower limits of the adolescent period. Not only were the average brain capacities calculated but also the average of the percentiles as compared with the normal percentiles of seeing people of equivalent age groups. The boys' group below 14 years averaged 11 years 1 month in age and were 118c.c. in average capacity below the older group who averaged 17½ years. The girls below 14 years were in average age also 6½ years younger than the older group but were only 26c.c. below them in average brain capacity. As indicated by their increased average deviation the girls of the younger group were more variable than the older girls but this was also the case with the boys. Nor was there any greater tendency of the girls' deviations to be on the plus side of the median. The proportion of numbers in the various groups did not vary greatly and undoubtedly the differences were too great to be due merely to chance selection. Leaving the latter factor out of consideration, we may say that our figures would make it appear that post-pubescent brain growth ceases at an earlier period or proceeds at a much slower rate in the blind girl as compared with the blind boy.

Taking the average capacity of each individual and expressing it in terms of the normal percentile for his or her own age group—a method which eliminates the effect

of chronological age—we find that in comparison with the normal seeing person the older group of boys have a better relative position, their average percentile being 39 as against the younger boys' average of 33.5. The girls exhibit a reverse tendency, the younger group having a better average percentile than the older. Those under 14 years had an average percentile of 38, those over 14 years an average percentile of 32.

On enquiry from Supt. Burritt we found that the post-pubescent training and experience of the girls and boys differ markedly. The boy is taught to be self reliant in many ways and his adaptability is developed in directions quite forbidden to the girl. The latter must, perforce, lead a much more sheltered existence. The boy is encouraged to find his way about town, to seek a situation, to mix as much as possible with seeing persons. The girl has fewer amusements, fewer occupations open to her, less social freedom and is not encouraged to fend for herself as is the boy. In the words of Supt. Burritt, "Blindness is a misfortune to the boy, a calamity to the girl."

A comparison of the I. Q.s obtained by application of a specially modified form of the Binet scale and supplied to us by Miss Crane, showed that the differences in brain capacity are reflected in the tests. The girls over 14 years had an average I. Q. of 87. The younger boys averaged 95 I. Q., the older group 94. Excluding one feeble-minded case (I. Q. 43) the older group would have had about the same average I. Q. as the younger. Each group had about the same number of cases below 75 I. Q. so that the differences in averages were not due to the presence of unequal numbers of the feeble-minded blind. The figures are given in Table 11.

TABLE 11

BLINDNESS AND BRAIN CAPACITY

No. of Cases	Group	Aver. Age	Aver. Brain Capacity	A. D.	Aver. Per-centile	Aver. I. Q.
43	Boys over 14 years	17^{6}	1395c.c.	77c.c.	39	94
36	Boys under 14 years	11^{1}	1277c.c.	93c.c.	33.5	95.5
31	Girls over 14 years	18	1283c.c.	62c.c.	32	87
33	Girls under 14 years	11^{6}	1257c.c.	60c.c.	38	92

It is interesting also to make a more direct comparison between the sexes. It will be seen by reference to the table that whilst the boys' advantage over the girls at 11 years of age is only 20c.c. at 18 years of age it is 112c.c.

If, as it appears, the individual differences in the sexes in post-pubescent brain growth are real differences and not due to chance selection, we must realize that the effect of blindness varies with the sexes. If our assumption of the cause of these differences is correct—and we have not been able to discover any other adequate explanation—then it would appear that environmental differences, particularly with regard to a varying demand for adaptation have a marked effect on the cerebral development of the individual. The direct physical effects of blindness on both sexes are understandable, but that the different environmental demands, especially the extra-scholastic, might so affect individual brain-growth is decidedly interesting.

Another enquiry had as its object the effect of age of incidence of blindness on cerebral development. The cases were divided into two groups for both girls and boys. Those who were recorded as being blind before two years of age were put in one group and those blind after two years in the other group. In order to obviate the effects of chronological age, each individual capacity was compared with the Berry-Porteus norm for his or her own age. The boys who were blind after two years of age had an average deviation from the normal of 78.7c.c. as against 96.5c.c. for those blind before two years. The girls blind after two years had an average deviation from the normal brain capacity of 70.3 as against 87.2 for those blind before two years. As these differences are mainly below the median we see that blindness even after the individual has had two years of sight results in a serious diminution of brain growth. Figures are given in Table 12.

TABLE 12

EFFECTS OF AGE OF BLINDNESS ON BRAIN CAPACITY

Group	Deviation from Normal Percentiles of Capacity	Deviation—Sexes Combined
Boys Blind after 2 years of age	78.7 Cub. Cent.	76c.c.
Girls Blind after 2 years of age	70.3 Cub. Cent.	
Boys Blind before 2 years of age	96.5 Cub. Cent.	91.9c.c.
Girls Blind before 2 years of age	87.2 Cub. Cent.	

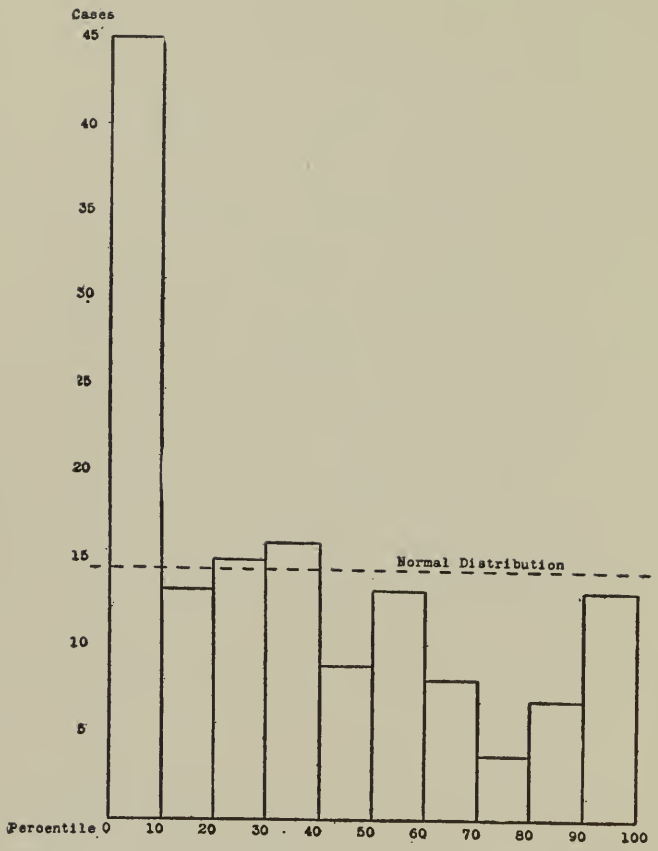


Fig. 6. Percentile Distribution of Brain Capacity of the Blind. 143 Cases.

The distribution of the blind brain capacities in comparison with normal percentiles can be judged from Figure 4. It will be seen that over 31 per cent. are found below the normal 10 percentile and 14 or about 10 per cent. above the 90 percentile, making 41 per cent in the extreme deciles.

A comparison of the single head measurements of the blind was also attempted but because of the great mixture of racial origins of the cases the problem is too complicated for presentation here. It will suffice to say that, generally speaking, the most marked deficiency in the blind was length of head and particularly so in the case of females. Breadth was a less deficient measurement and height of head the nearest to normality both in average and variability. This is in accordance with the expectation based on the fact of the localization of the centers for sight in the occipital lobes of the brain.

It is not claimed that this investigation is more than suggestive as regards its conclusions. Comparisons of averages, unless based on large numbers of cases, may be misleading. It is hoped that the publication of our results and the reference to the interesting problems involved may stimulate further and more careful researches.

PHYSICAL AND PSYCHOPHYSICAL DEVELOPMENT

Some attention has been paid to the question of the general physical development. In this part of our study we have followed Doll's method[1] of comparing individual measurements of standing height, sitting height and weight with the Smedley percentile tables for normals. These three percentiles are then averaged to obtain what Doll calls the

[1] "Anthropometry as an Aid to Mental Diagnosis." By Edgar A. Doll. Research Publication No. 8. Laboratory of Training School at Vineland.

"physical average." Similarly the right and left grip and spirometer records are compared with the normal and these percentiles are averaged for the "psycho-physical average." If the physical average percentile exceeds the psycho-physical the difference is called the physical excess and this Doll has shown to be characteristic of defectives.

The physical and psycho-physical development of our groups as expressed by these averages is shown in Figure 7 and Figure 8. Figure 7 shows that it is very infrequently that children at feeble-minded levels are above the normal 50 percentile in both physical and psycho-physical measurements. (Percentiles for these cases are shown to the right of the figure.) The group with delinquent tendencies however, shows relatively a much greater number developing above the average, and hence is physically superior. It is possible that there is a distinct relation between their delinquency and a physical over-development and activity. Of the group at dull normal levels the largest percentage above the normal median in both sets of measurements is found among the psychopathic.

Figure 8 gives the percentage of those who are not only physically poorly endowed but whose strength and lung capacity are also below normal. These are the opposites in respect to strength and bodily development to the cases represented by the previous figure.

Of those at feeble-minded levels the least number of cases with both averages below the normal percentile is shown by the delinquent group. In other words physical inferiority is not so much associated with delinquency as with simple feeble-mindedness and psychopathy. The well-adjusted feeble-minded show the largest percentage with poor physical endowment. The dull normal groups show

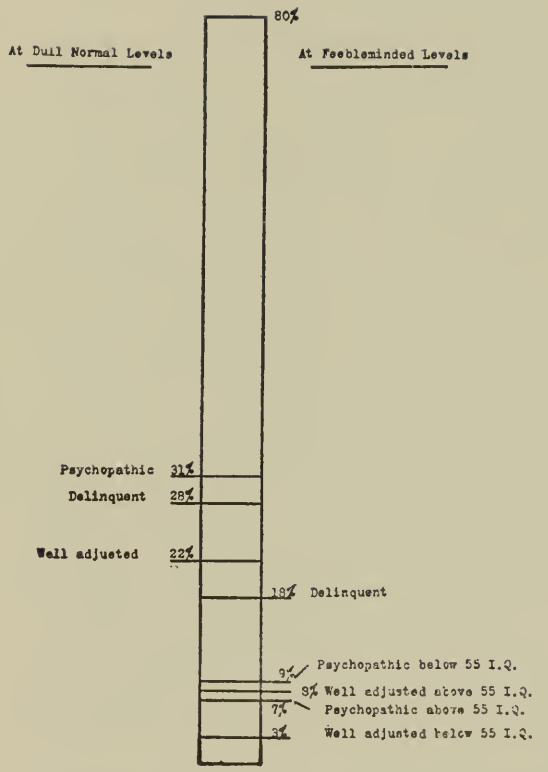


Fig. 7. Percentage of Cases Above 50 Percentile in Both Physical and Psychophysical Measurements.

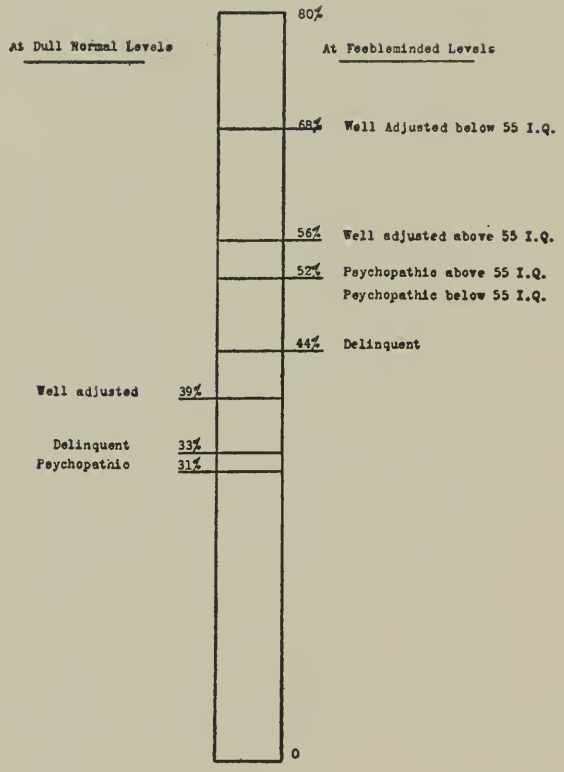


Fig. 8. Percentage of Cases Below 50 Percentile in Both Physical and Psychophysical Measurements.

smaller percentages of physically inferior but the percentages are more closely grouped, indicating, as is the case with other anthropometric measurements, that the higher we rise in the scale of intelligence levels the less significant the physical differences are.

Taking into consideration the physical excess or the excess of the physical average over the psycho-physical, we find that 76 per cent. of the well-adjusted, 70 per cent. of the psychopathic and 60 per cent. of the delinquent feeble-minded show a physical excess amounting to more than 10 points between the average percentiles. We see again the greater tendency of the delinquents to "level up"—in other words for their strength to match their physical development. The psychopathic would appear by these figures to be nearer the normal condition than the well adjusted, but we found that they possessed greater variability in this regard than either of the other groups. Only 16 per cent. of the delinquent dull normals showed physical excess of more than 30 points as against 46 per cent. of the psychopathic and 35 per cent. of the well-adjusted. In the feeble-minded groups 30 per cent. of the delinquent, 49 per cent. of the psychopathic, and 42 per cent. of the well-adjusted showed a physical excess above 30 points as indicated by percentile differences.

Hence both as regards the largest number of children reaching above the normal median in physical and psychophysical measurements, the smallest number below the median, and also the extent of the deficiency in bodily strength as compared with physical development, the delinquents stand nearest the normal standards. The psychopathic are distinguished by their greater variability. The percentages for the various groups are given in Table 13.

TABLE 13

PHYSICAL AND PSYCHOPHYSICAL MEASUREMENTS

	Dull Nor. Delin.	Dull Nor. Psy.	Dull Nor. W. Adj.	F. M. Del.	F. M. Psy.	F. M. W. Adj.
Physical and Psychophysical above normal median	28%	31%	22%	18%	8%	4%
Physical and Psychophysical below normal median	33%	31%	39%	44%	53%	64%
Physical and Psychophysical difference less than 10 points	35%	15.4%	35%	24%	25%	20%
Physical Excess More than 30 points	16%	46.2%	35%	30%	49%	42%
Psycho-physical Excess more than 10 points	16%	0	11%	16%	6%	4%

As regards a comparison of the averages of the single measurements this may be obtained through Tables 14 and 15 which present the figures for the physical and psycho-physical measurements.

Amongst the dull normal groups the psychopathic head the list not only in absolute measurements but also relatively to chronological age. The average percentile was arrived at by comparing each individual's measurement with the normal percentile of his own age group and averaging these percentile measurements.

Of the feeble-minded group the delinquents are second in average percentiles, second in standing height, first in sitting height and first in weight. Their average weight is really above the normal median. Physically, therefore, they are inclined to be short-limbed, long trunked and heavy in comparison with the rest of the feeble-minded. Table 15 gives in a similar way the results as regards psycho-physical measurements.

An examination of this table shows that the superiority of the dull normal psychopathic cases as regards physical development is not paralleled by superior strength of grip. Their average percentiles of right and left grip are the lowest of the three groups though in vital capacity they head the averages. In right grip and vital capacity the group is extremely variable.

The psychopathic group above 55 I. Q. also occupy relatively the lowest position when compared with the groups of delinquents and well-adjusted of their own mentality levels. Their average percentile is 5 points below that of the well-adjusted and 11 points below the delinquents in right grip. Their disadvantage in comparison with the delinquents in left grip is even more marked. They show an

TABLE 14

PHYSICAL MEASUREMENTS

Group	No. of Cases	Av. age	Standing Height			Sitting Height			Weight		
			Av.	A. D	Per-cent-ile	Av.	A. D	Per-cent-ile	Av.	A. D.	Per-cent-ile
Del. +75	43	13.6	1474	146	54	764	72	56	43.3	11.7	56
Psy. +75	15	15.7	1629	137	72	854	73	66	45.9	13.3	66
Well Adj. +75	29	13.3	1465	156	56	775	76	50	40.7	13.5	52
Del. —75	50	15.2	1544	116	48	805	50	42	48.	12.4	53
Psy. +55	34	17.4	1609	110	45	823	64	33	52 4	11.2	43
Psy. —55	51	12.7	1496	171	45	769	83	35	43.7	12.4	44
Well Adj. +55	71	14.5	1495	145	49	786	85	39	44.4	13.5	48
Well Adj. —55	171	13.4	1461	146	36	776	68	29	41.8	12.7	37

TABLE 15

PSYCHOPHYSICAL MEASUREMENTS.

Group	No. of Cases	Av. age	Right Grip			Left Grip			Vital Capacity		
			Av.	A. D.	Per-cent-ile	Av.	A. D	Per-cent-ile	Av.	A. D	Per-cent-ile
Del. +75 Psy.	43	13.6	26.	8.8	47.8	25.	8.7	51.8	2043	597	38.2
+75 Well Adj.	15	15.7	22.6	12.1	35.1	27.	9.	31.6	2579	831	45.7
+55 Del.	29	14.8	21.5	9.	38.1	20.6	10.2	39.1	1700	650	24.5
+55 Psy.	50	15.2	26.8	7.4	31.9	43.	18.	36.8	2097	509	25.5
+55 Psy.	34	17.4	31.6	10.2	20.7	28.4	9.3	19.5	3397	680	19.1
—55 Well Adj.	51	14.8	21.4	10.1	13.3	20.	9.5	15.3	1559	881	11.3
+55 Well Adj.	71	14.5	24.8	10.2	25.8	21.5	7.6	23.8	1885	657	18.2
—55	171	14.0	18.	8.4	12.1	17.6	7.9	13.3	1346	660	7.7

inferiority of 17 points. In vital capacity they have a better average than the well-adjusted but are 6 points below the delinquents. Hence we may say that a very low strength of grip in proportion to body size, except in cases of very low mentality, is somewhat symptomatic of psychopathy.

Throughout these tables the physical superiority of the delinquent group is well marked. This superiority is not so apparent as regards standing height as it is in strength of grip. This bears out the view previously expressed as to the physical over-activity and strength of the delinquent group.

If the conclusion arrived at through these figures be valid there is indicated a valuable lesson for the training of delinquents and delinquent defectives. Organized games, drills, and gymnastics of all kinds should be made very special features of their training so as to provide safety valves for their over-activity. Games which put a premium on the self-restraint and discipline involved in team work should be chosen. To what extent this self restraint for the sake of the game will be carried over into life may be doubtful, but at least there would be the opportunity to inculcate and develop ideals of fair play which assuredly would have an abiding influence on character. It is doubtful whether games are used as a means of training and reform to the extent that they should be. A careful psychological analysis of games should be undertaken and made the basis of a selection of those suitable for delinquents and defectives. At present the organizing of games for delinquents appears to be a very haphazard affair. Some of those habitually played place an emphasis on the very characteristics in the delinquent make-up which it is desirable to suppress.

CHAPTER IV

PORTEUS MAZE TESTS

In 1912-13 the writer carried out an intensive study of children in special classes in Melbourne, Australia. As a first step in the investigation the children, before entering the classes, were examined by the Goddard Revision of the Binet tests, by the De Sanctis tests and by specially devised tests of educational requirements.

Careful records were then kept of the children's progress in academic and manual work. These records were made up on the basis of the writer's direct personal observation of the pupils supplemented by reports from the class teachers. It was soon apparent that although the De Sanctis tests were useful with the lower grades of mentality they had little reliability in the case of children of higher mentality. The Binet, too, though it gave fairly reliable indications of the mental adaptability of many cases, in other cases gave an intelligence level that did not by any means match the child's performance. Had the differences between mental level and school performance been always in favor of the tests one might have blamed the faulty teaching system. Unfortunately for this explanation this was not the case. Not only were children over-estimated by the tests but others were just as surely under-estimated. This was particularly the case when a comparison was made between the test results and progress in and fitness for industrial work, such as toy making, shoe making, housework and cooking.

Certain children showed a far greater adaptability to industrial work than other children of equal Binet age. On the other hand certain children of apparently high mental level had constant difficulties in social and school adjustment. Such children were always at odds either with their teacher or classmates. It was the high grade cases who provided disciplinary problems and who were the greatest disappointments as regards their progress. When the observations were extended to take in those who were leaving the classes to go into the community, the differences between success and test performances were if anything accentuated.

As a consequence of these comparisons the writer, though impressed with the general usefulness of the Binet tests and of the correctness of their average results, became distrustful of their value when they were relied upon either for diagnosis or prognosis in individual cases. The need seemed apparent for tests of a less linguistic type, tests that would prove the ability of the person to perform a concrete task calling for mental alertness and practical common sense.

After some experimental work with other test material, it was found that the printed maze provided a problem in adjusting means to ends that brought into play certain important traits both mental and temperamental. Impulsive, headstrong children with little tendency to preconsideration, the nervous and excitable, the irresolute and easily confused, the impractical, the dreamy and dependent, the over-confident, the over inhibited, or children too self-determined to heed or follow instructions accurately—all these types of cases tended to show comparatively poor performance in tests of this nature. These defects may be the more easily detected because the maze test, in common with some other performance tests, gives the examiner the opportunity to watch the

actual working out of the problem provided. Not only is he enabled to score the test right or wrong but by observing the person's behavior he may assign the cause of failure. This appreciation of the quality of the response involved in the carrying out of a somewhat prolonged motor task is impossible in a purely intellectual operation such as a rote memory test. Another advantage of the maze as test material is one that is not shared by all performance tests. The test is self-corrective in the sense that the subject may discover his own mistake and may realize for himself reasons for failure, such as hastiness or over-confidence. He may then readjust his methods on a second trial. For instance, a child who takes the obvious path leading into a *cul-de-sac* does not need to be informed of his error and may learn by his mistake to adopt a more cautious or preconsidered procedure. Trial and error methods, though penalized in the scoring, are not entirely eliminated.

Because of the evident value of preconsideration in the printed maze test, it differs essentially from a real maze. There would be a parallel between the actual maze and the printed form if, in the former, a platform were provided in the centre of the maze by mounting which the subject could view the whole plan and map out his course of action. There would be a still closer parallel if, in addition to the central platform, the subject were allowed to carry with him a step-ladder which at any point he could erect so as to verify his course. This preconsideration of the task as a whole, supplemented by pauses for consideration at doubtful points, is precisely the most intelligent procedure in the printed maze.

Because the actual maze does not provide these essential conditions the facts learned through the observation of

the maze running of animals cannot be carried over to human performance in the printed maze. One is a test of new habit-making, the other is a test as to whether in life-experience habits of prudence and forethought have already been set up and have become characteristic of the subject's behavior. It is also necessary to point out that there are essential differences between maze tests scored by time and those scored by accuracy. In a maze test scored by time, the subject is usually allowed to correct his own errors. If he is not allowed to do this, but must begin again at the beginning of the test, he must either have a new test blank or be confused or assisted, as the case may be, by the pencil markings on the original blank. A mistake near the end of the test is thus penalized by reason of time consumed in going back to the beginning far more than a mistake at the outset. As a matter of fact, an error at the beginning may be of equal or more significance than an error near the end. If errors are not considered and the subject knows that his time is scored he may deliberately sacrifice his chances of accuracy to attain speed. In fact, the more prudential and farseeing the subject is the more likely he is to abandon his ordinary habit of preconsideration for the sake of obtaining a good score in the test. Scored on speed alone the test may resemble more the ordinary maze running test, i. e., become a test of new habit formation.

Maze running after all provides such an artificial situation—one that is so widely divorced from real life conditions—that it is strange that it should ever have been considered as providing indications of varying intelligence. Its conditions are such that it does not adequately test prudence in either animal or man, and prudence surely includes a complex of capacities most essential for the preservation of

the species. "Look before you leap" embodies advice applicable to many situations. In an actual maze, preconsideration has no value. The speed of performance of a task new to experience is only of value as an index of intelligence provided that the task calls into play capacities of general relation to social adaptation.

It should also be recognized that the relative importance of speed and accuracy vary in different tests. Given a certain level of proficiency, say, in adding digits, one would expect a high correlation between speed and accuracy in such a test. In a complicated maze careful preconsideration has such a value in ensuring accuracy that a much lower correlation with speed would naturally be apparent. As regards the comparative value of the scoring methods in such a test as the printed maze, which is intended to bring to light capacities important to social adaptation, we need go no farther than an appeal to popular experience. "Slow and sure" has a vastly different social significance to "quick but inaccurate." Admittedly a combination of "speed and accuracy" scoring would be ideal, but immediately the subject knows that speed is scored the value of the test changes.

It does not appear to be recognized by some who have followed the present writer in the use of the maze as test material that considerably more psychological insight together with experience with the tests is involved in laying down the test conditions than in devising the tests themselves. The scoring conditions and the technology of the graded maze tests are by no means arbitrary but are based on long experimentation. It may be as well, even at the risk of pointing out the obvious, to devote some space to the discussion of the test conditions.

In the construction of the test provision is made for a

similar situation to recur again and again. In each of these situations the subject must make a choice as to the direction in which to move the pencil and as there is only one right course, success is dependent usually on preconsideration and tracing out the plan with the eye before beginning the test. In order to guard against chance successes even the simplest mazes must allow enough "traps" in their construction as to render it unlikely that the child will thread the whole course correctly without a preconsidered plan.

To allow the subject to correct his own mistake and go on to the completion of the test would prevent the examiner from judging whether the commission of an error affects the subject's reaction. To enable this observation to be made the number of "traps" would have to be multiplied to such an extent as to make the test extremely complicated. The procedure we have adopted is to stop the child directly he realizes that he has committed an error and supply him with a new blank which he recommences from the beginning. This recommencement serves to emphasize in the child's mind the importance of an error and acts as an incitement to more careful working.

Another advantage of recommencing the test after an error is that the chances of accidental success are reduced. Experience has shown that, even in a test as complicated as the 12 year maze, a child may get almost to the end of the test before committing an error. When the test is repeated from the beginning with new blanks he may not in three more trials reach without an error as far as he did on the first trial. Had he been allowed to retrace his course at the first trial he would have completed the test easily and gained almost full credit for both speed and accuracy, when as a matter of fact his success was purely accidental. Since

only one test is provided for each year accidental success must be guarded against as carefully as possible.

Limits must, however, be put on the number of repeated trials allowed in each test. This limitation is necessary in order to make the amount of practice afforded in working out the tests as nearly equal for all cases as possible. To allow a child as many trials as are necessary to complete a test successfully means that he may be getting practice which would help him to pass the higher tests. Accordingly the rule was made that immediately the subject had completed the allowed number of trials in a test, the next test was proceeded with whether the lower test had been passed successfully or not. Greater uniformity of opportunity was also provided for by the rule that the testing should continue until failures had resulted in two successive years. Here again the need was apparent, if the series were to be limited in number to one test for each year, not to penalize unduly the first failure. Two trials are therefore allotted to each test except those for 12 and 13-14 years, where four trials are allowed. Here again the guarding against chance success determines the procedure of allowing a greater number of trials rather than of reducing the complexity of the test design.

It is evident that whilst the testing conditions should allow opportunity for readaptation of methods there should be some penalties for errors. This end is gained by a system of deductions from the final mental age for tests in which there are repeated trials given. Half credit only is allowed for tests which are passed on the last trial allowed by the conditions. In this way the child who requires repeated trials is penalized.

One of the excellences of the maze as test material lies

in the fact that a series of mazes may be graded without altering the nature of the test. The number of possible errors may be increased by introducing false openings which must be passed by, bringing into play a resistance to the suggestion which the opening implies. The fundamental capacity that is tried by the test is the power of visual analysis of the maze situation. This in itself is not an extremely difficult task; in other words, it calls only to a slight extent for any highly specialized ability such as memory for direction. The progressive steps to be planned ahead are few and the distance the eye needs to traverse is comparatively short. Another advantage of a graded series of mazes lies in the fact that by working through the lower mazes a certain amount of practice is afforded, so that by the time the subject reaches the tests at the level of his ability the nature of the problem is well understood. By the time the highest tests are reached the intelligent person should realize the fact that the whole course to be pursued from centre to the outside of the maze need not be memorized, and that each problem may be attacked piecemeal. For this reason the testing, even with older children, begins with the lower series. To commence with one of the 12 or 14 year tests makes the task more difficult, as the subject has no knowledge of the nature of the problem and may think it necessary to envisage the whole maze and then to memorize the course to be pursued.

Hence, whilst the fundamental capacity to be exercised is of a comparatively simple nature, it will be realized that one of the most important factors for success lies in the subject's mental attitude towards the test problem. It is not only a question as to whether the individual really has the capacity to make a visual analysis of the problem, but

whether he has the disposition or the willingness to look ahead and to work carefully and prudently. The test is really more a test of care and execution and of the habit of using foresight than a test of foresight itself. It is not suggested that children of the same age differ very greatly in the ability to plan a course but they do differ markedly in their *tendency* to use a careful and considered plan. In other words, performance in the maze tests, because of the simple nature of the mental processes involved, would not necessarily correlate very highly with planning capacity in, say, dress designing or in architecture where the mental processes are of a highly specialized kind. It must also be recognized that we cannot have tests of planning capacity as such. Planning capacity may differ very greatly in different fields of action. What we are attempting to evaluate by the maze test is not the extent of the person's planning capacity, but rather his tendency when faced with a concrete situation to take very ordinary precautions against error, especially when he realizes that error is costly. Because the tests apply to such generalized habits they are so much the more likely to be of value in helping us to predict the individual's responses in life's every day situations. Habits of prudent and preconsidered action will undoubtedly have a great bearing on social efficiency. As regards industrial occupations we may also expect a high correlation between the tests and tasks in which success is not merely a matter of manual skill or technical judgment, but is dependent also on whether the individual can sustain responsibility. In other words, success in the maze tests is not particularly related to success in certain low industrial operations which involve unskilled routine effort only, such as shoveling coal; nor is it related to high grade occupations which

demand highly developed technical knowledge. Success in the tests should, however, be related to success in occupations midway between the unskilled and the highly technical and these are the ones in which high grade defectives are usually trained for. Hence the test may serve to differentiate defectives who may become self-supporting from those who may not.

Two adult tests have been added to the series, but whether these tests have the same application and value as the lower tests is by no means certain. Directly the complexity of a performance test proceeds beyond a certain point it changes its character and becomes a specialized test for a particular kind of capacity. To those who have not this special kind of ability the test then has the significance only of a puzzle. For instance, a maze may become so complicated as to make it probable that a trial and error method is just as likely to result in success as a carefully considered plan. Certain persons with an aptitude for puzzle-solving of this kind, due to a special ability for visual analysis of the maze situation, would solve such puzzles much more easily than others. Hence we are uncertain of the interpretation of the adult tests which naturally are very complex.

Summing up what we have stated regarding the nature of the maze test we may say that in the high grade case it tests the tendency, not the ability, of the individual to use foresight, prudence, mental alertness in a concrete task. Conversely it enables us to detect the person whose habitual reactions show feeble inhibition or mental obtuseness. It should be emphasized that we speak of the habitual reaction because it is habit or tendency with which we are concerned.

As regards the relation of performance in the maze

tests to conduct disorders, consideration must be given not only to the question of the comparative strength of inhibitions in individuals, but also to the comparative strength of their instinctive tendencies. Our dominant interests, the set of our life's currents, affect our characters. One individual may be very prudential in most directions, but because of the strength of one instinctive tendency there may be a class of situations in which he shows the grossest imprudence. A person may have a normal power of inhibition as regards stealing and be exceedingly weak willed as regards sex propensities. It is not at all likely that such a person's response to the maze tests will show up this particular tendency to delinquent action. The idea that because all delinquents have shown a feeble inhibition in some direction or other they should therefore score low in the tests is not at all borne out by the facts. On the other hand those with a generalized weakness of will permeating the whole personality and whose particular form of delinquency, though incidental to the environment, is an expression of general constitutional inadequacy, should be differentiated by the tests. In other words, failure in the tests is more significant than success.

It is noteworthy, however, that even though the test age credited to many delinquents may be relatively high, their mental alertness as shown in quickness of perception and readiness of action being often in evidence, their responses to the tests may show qualitative differences to those of normals of equal test age. In other words, observation of the test response may bring to light important temperamental differences which are not to be expressed in terms of mental or test age.

Because of the necessity of requiring a rather simple proof of the fundamental mental capacities involved, it hap-

pens that not only certain delinquents, but also certain types of psychopathic children, tend to score too highly in the tests. The maze test suffers the same disabilities as most other performance tests, viz., it demands the sustaining of attention for a comparatively short period. In addition there is the constant stimulus of the presence of the examiner—in other words, the test presents the characteristics of a short, well supervised task of a novel nature. This is precisely the kind of work that psychopathic children of good native ability excel in, but they lack the stability of temperament to sustain their interest in the longer, less novel, and more arduous tasks of every day industry. These children are often attracted by the puzzle interest in the test. If they are of the obtrusive kind they like to "show off" their ability and hence score much higher than their general level of social performance warrants. Responses of this type will be discussed later. In passing we may remark that these cases are comparatively infrequent. Usually the psychopathic child's inability to adjust himself to concrete situations is shown up excellently by a low test age in comparison with the Binet. Goddard,[1] quoting findings at the Bureau of Juvenile Research, Ohio, remarks that the psychopaths tend "to do spectacularly poor work in the Porteus tests." In another article Dr. Mateer[2] refers to their records in these tests as follows: "They do spectacular work on the Porteus, but one cannot tell which extreme they will score." It is evident that there are two types of psychopaths differentiated by extreme scores in the tests—the poorly equipped, mentally inadequate or constitutionally inferior personality and the child with good native ability

[1] "Problem of the Psychopathic Child." By Henry H. Goddard. American Jour. of Insanity. April, 1921.

[2] "The Future of Clinical Psychology." By Florence Mateer. Jour. of Delinquency. January, 1921.

but who is egocentric in attitude, obtrusive in behavior and who tends to show up well in a short, well-supervised task.

Briefly summarized, some of the advantages of the maze tests are as follows:

1. Ease of application. The time that is taken in applying these tests rarely exceeds fifteen minutes for the whole series.

2. Independence of language. They may be applied easily to deaf and dumb, to illiterates and to groups of cases who do not speak English.

3. They provide a concrete task as distinguished from the purely verbal test. Practical intelligence—the ability to work with things rather than with figures and words is given a favorable opportunity for expression.

4. They are usually independent of the child's previous experience.

5. They appeal to the child's interest so that he puts forth his best efforts.

6. They test fundamentally the same group of capacities throughout. The only test in which language enters as a factor is in the 5 year test, which is largely a test of understanding and following directions.

7. The mental age standardization makes them usable as a parallel series to the Binet.

Some disadvantages of the tests are chiefly:

1. As previously pointed out the test age is sometimes an over-estimation of the mental level of certain psychopathic types, and certain delinquents.

2. They also exaggerate the ability of certain defectives who are steady-going and dependable but are overcautious and physically inactive. Since there is no time limit imposed in the tests these children, whose adjustments in

every day life are painfully slow, sometimes gain too high a rating by the test. The reasons why speed is not taken into account in the scoring have already been discussed. We would add to these reasons the observation that individuals differ very much in their speed preferences or in other words, all have a certain "tempo" at which they do their best work. By allowing the subject to work at his own pace we give him the opportunity to show at his best. Admittedly this procedure allows certain individuals to score too highly, yet we feel that it is better that some defectives should be over-rated than that some normals should be under-rated. The comparative ease of the standardization of the tests is another reason why failure in them is so significant.

APPLICATION OF THE TESTS

The tests having been arranged and the procedure determined by experimentation, they were then tentatively standardized and applied to groups of defectives. These groups were not large but, as was the case with the Binet results, the endeavor was made to make a comparison between the test scores and the observed progress of the child in the schoolroom and workshop. It was soon found that the tests had great diagnostic value, especially when they were used in conjunction with the Binet. It was found that whilst the tests could not be relied upon in the prediction of the children's progress in ordinary school studies, it was almost invariably the child with high maze test age who assimilated training best in the woodwork classes and in other forms of manual instruction. In addition to the aid that the tests furnished in the grading of the defective it was found that as regards cases about the border line the tests gave us help

in diagnosis when help was most needed. Cases at dull normal levels who because of stability of temperament and industrial ability showed a general social adaptability, usually scored well above their Binet level. On the contrary the too-linguistic type with little practical ability or with instability of temperament tended to score distinctly below their Binet age.

In order to prove still further the applicability of the test to defectives of even lower grades than special school cases and also to compare children's scores with their ability to adjust themselves in an institution, investigations were undertaken at the Kew Hospital for the Insane to which were attached cottages for feeble-minded individuals. Comparisons were made between the test scores and the rank order of industrial adaptability as given by the medical superintendent, Dr. Gamble. These were found to agree very closely. The five year test—now the four year test of the revised series—was found to have a particular value in grading cases at and below that level. This test consists of a double outline of a Maltese cross, the task being for the child to draw round the outline without crossing the line. The care and prudence revealed by the child's effort to turn the corners were found to be very characteristic of its habitual reactions so that the test proved an excellent measure of the child's trainability in simple tasks. The untrainable defectives tended to show an infinite *incapacity* to take pains. In the endeavor to interpret these test results various studies were undertaken at kindergartens in the city school system of Melbourne and in each case comparisons were made between teachers' ratings and test performance.

After about two years of experimentation the author felt sufficiently convinced of the practical value of the tests

to report the results publicly. A paper was presented to the Education section of the British Association for the Advancement of Science, which met in Melbourne in August, 1914. In this paper the results up to that date were presented. Further work was then undertaken in the proving of the reliability of the tests as diagnostic aids. The writer, working in conjunction with Dr. Smyth, Professor of Education at the Melbourne University, visited the Institution for Deaf and Dumb, where the tests were applied. It was found that the children whom the school principal designated as making least educational progress and who were rated by him as being feeble-minded, were picked out by the tests.[1]

Shortly after this (June, 1915) the tests were published in England in the Journal of Experimental Pedagogy and in America in the Journal of Psycho-Asthenics. Up to this time they had not been applied to normals except for the purposes of tentative standardization. They were then used with a group of 653 children attending the primary schools, and on the basis of these results the revised scoring, involving penalties for repeated trials, was adopted. Results together with this revised scoring were published in an article in the Journal of Educational Psychology. It was pointed out in this article that significant sex differences in performance were brought to light by these tests, the boys having a distinctly better average performance.

About this time the tests were also applied to groups of delinquent boys at several reformatories with the result that the delinquents were shown to score on the average below the normal children. Apparently the more pronounced the

[1] The applicability of the maze tests to the deaf has been confirmed by the work of Dr. C. Miranda in the Medico-Pedagogical Institute at Lisbon, Portugal. Results are to be published under the title—"Modo prático de medir a inteligência dos crianças (Aplicaçao do Test de Porteus aos alunos da casa pia").

tendency to delinquency in the child the lower his test record tended to be.

Shortly after this the opportunity occurred to examine a group of Australian aboriginal children. South Australia, the central Australian state, at this time maintained a colony for aboriginals at a mission station at Point McLeay on Lake Alexandrina at the mouth of the Murray River. In company with Dr. Halley, chief medical officer of schools in the state, the writer journeyed from Adelaide and examined a group of children who were members of the Narrinyeri tribe. These blacks were partly supported at the colony by grants of food and clothing from the State Government. In passing it might be mentioned that a special interest attached to this investigation as being the first psychological examination of children of this race. The aboriginal himself occupies a most interesting position in the evolutionary scale. In many respects he resembles our own primitive ancestors. His only weapons were the stone hatchet—which he fashioned and polished exactly in the fashion of Neolithic man —flint scrapers, wooden spears, clubs, shields and boomerangs. Agriculture was not practised, and industrial arts were limited to the making of weapons and the weaving of rude reed baskets, hair strings for girdles, and the sewing into rugs of the skins of animals. The development of a large body of folk lore and of a totemic system governing tribal organizations were, however, indications of a degree of culture probably above that of really primitive man. Still the fact remains that these people are human anachronisms and belong by right to a prehistoric age. Because of Australia's isolation and vast expanse they have been able to survive through lack of competition to modern times. As they are rapidly dying out after contact with the whites there

are few opportunities to obtain any indications as to the mental characteristics of the children. An attempt was made to apply the Binet in modified form, but the diffidence of the black children was in many cases fatal to the success of the test—the only response to the questions being wildly rolling eyes or a continuous giggle. It was found, however, that there was little difficulty in interesting them in the maze test. It was thought probable that with the black's very highly developed sense of memory for direction a maze test would prove easy for them. Even though the original method of scoring was adopted it was found that hardly a single child, no matter at what age, reached a 12 year test. At the same time the responses of the younger children to the lower tests were marked by quickness of perception and mental alertness. Directly the test began to be complicated, however, impulsive and ill-considered action became the rule. There was no attempt at forethought or preliminary planning. The retardation became marked at about the age of puberty, the older children showing very little of the mental sprightliness and alertness of the younger ones. The only children to reach a moderate level of success were those of mixed blood, although their reactions at pubertal levels showed apparently the same slowing down process.

A school was conducted at this station and the impression gained from the tests was confirmed by the teacher, who stated that up to the age of eight or nine years the children did not show much less progress than young children of the white race. They went along very well to about third or possibly fourth standard but could not, except in rare instances, be carried beyond this grade. These observations were confirmed when subsequent investigations were undertaken by the writer at Lake Tyers, another aboriginal reser-

vation of the Gippsland tribe in the neighboring state of Victoria. Dr. Halley, in the physical examination, was also struck by the precocity of development in the younger children, puberty apparently being very early established. The results of this examination were reported briefly in the Psychological Review for January, 1917.

An analysis of the results of this examination, using the revised method of scoring the tests, shows a somewhat different result to that reported in the previous article. The number of children whose test scores were above their chronological age was 5 or 18% of the group. The average chronological age of this group was nine years (av. dev., 5 months) and the mental age ten years (av. dev., 4 months). The number of children "at age" by the tests was nine or 32% of the total. They averaged, in both chronological age and mental age, nine years with an average deviation of one year. The retarded by tests made up 50% of the group, and their average chronological age was 11.2 years (av. dev., 2 years), with an average mental age of 9.5 years (av. dev., 1.8 years).

These results served not only to confirm but to accentuate the tendencies noted above. Only one child obtained as high as 12 years' credit and he had probably a considerable admixture of white blood. The older the children the more serious the mental retardation appeared to be.

APPLICATION OF THE TESTS TO NORMALS

As part of the work of the Laboratory of Educational Anthropology established by Prof. R. J. A. Berry in the Anatomy Dept. of Melbourne University, and of which the present writer was co-director, an examination of a

group of one thousand normal school children was undertaken. The results of this examination showed that the tests were too easy up to about the chronological age level of eight years and rather too difficult for the years above this level. The correlations between the Binet and Porteus tests for the various age groups ranged from .24 to .61 in the case of boys and from .41 to .75 in the case of girls.

Because of the limited range of mental ages—the children of each group being all of the same chronological age and distributed through the normal school grades—they might be considered a selected group as regards their intelligence. This restriction of the range of intelligence has the effect of lowering the correlation so that even a correlation of the order of .3 has more significance than its relation to its probable error would indicate. This should be remembered when considering the correlations as given in Table 16.

TABLE 16

BINET-PORTEUS CORRELATIONS.

Boys, 476 Cases—Girls, 467 Cases.

Age	No. of Cases	Correlation (Pearson r)	P. E.	No. of Cases	Correlation	P. E.
6 yrs.	43	.42	.085	28	.48	.098
7 yrs.	63	.24	.08	63	.57	.057
8 yrs.	76	.39	.066	76	.41	.064
9 yrs.	63	.56	.058	77	.75	.034
10 yrs.	49	.61	.066	70	.61	.051
11 yrs.	60	.6	.056	50	.56	.066
12 yrs.	66	.55	.058	61	.46	.068
13 yrs.	56	.39	.076	42	.63	.063

In every year of life from 5 to 14 the boys had a noticeably better average test age than the girls, except at year 12, where the girls exceeded the boys, and at year thirteen, where they had a slight advantage. The girls' advantage at twelve years was all the more marked because the eleven-year group showed the worst record of any year group in comparison with the boys. These results made it appear that either the boys' development slowed down at twelve or the girls' development became accelerated. As a matter of fact, the boys made a relatively slight increase from 11½ to 12½ years of age, whilst the girls showed at this period the greatest gain in average test age. During the next year (12½-13½ years) the boys' averages improve markedly but the girls also make good gains, so that they still hold a slight advantage.

As a result of this investigation the scoring was altered somewhat and the tests applied to another group of 1255 cases. These alterations improved the standardization of the tests considerably, particularly for the middle years of the series. The old six year tests were dropped a year in mental age value and two new tests for six and seven years interpolated in the series. The application by Miss Foote of the new tests to 198 six and seven year children in 1919 showed that these tests were comparatively well standardized.

Again, however, similar sex differences came to light. The boys showed a better average test performance for every chronological age group except at twelve years, where, as in the previous investigation, the girls held an advantage. As before, at thirteen years these performances were about equal.

The girls at 12 years again showed the greatest absolute gain in average test age. The 11 year group had an aver-

age of 10.81 years in test age, whilst the 12 year group averaged 12.16 years. As the differences were found in the two investigations and were of such extent, it seemed most improbable that the results could be due to chance selection. In the second investigation the number of cases for the 6 and 12 year groups approached 100—a sufficient statistical group.

The conclusion appeared amply justified that boys do show a marked advantage in performance in these tests except at 12 years, at which age, or, at least, in the year of life from 11½ to 12½ years of age, girls show a marked development in ability as measured by the tests. As regards the Binet examination of the 1000 cases of the 1916 investigation the relative improvement in test age at the same period is also marked. The figures for both these investigations are given in Table 17, which is reproduced from the Berry-Porteus monograph.

An interesting fact with regard to sex differences in performance in the maze tests was also brought to light in the last investigation. Some of the cases were drawn from schools in localities where the population was of decidedly lower social grade than in others. When the results were compared for the two social grades it was found that the boys of higher social grade had a pronounced advantage over girls in average test age except at age twelve years. In children of lower social grade the tendency of the boys to have an advantage was not nearly so marked nor as constant.

In 1920, Miss Bassett, whilst holding a research fellowship at the Vineland laboratory carried out in conjunction

[1] "Sex Differences in Porteus Maze Test Performance." By Dorothy M. Bassett and S. D. Porteus. Research Publication No. 22, Training School at Vineland, N. J.

TABLE 17

SEX DIFFERENCES IN PERFORMANCE. PORTEUS TESTS

	1000 Cases. 1916 (Porteus)					1255 Cases. 1918 (Porteus)					198 Cases. 1919 (Foote)				
Chron. Age	No. of Cases	Boys' Test Age	No. of Cases	Girls' Test Age	Difference	No. of Cases	Boys' Test Age	No. of Cases	Girls' Test Age	Difference	No. of Cases	Boys' Test Age	No. of Cases	Girls' Test Age	Difference
5.5	16	7.27	16	6.63	B.64										
6.5	43	7.92	28	7.54	.38	64	7.15	64	6.91	B .24	52	7.32	46	6.53	B .79
7.5	63	8.57	63	7.98	.59	75	7.62	75	7.44	.18	45	7.96	55	7.3	B .66
8.5	76	8.95	76	8.39	.56	78	8.66	67	8.32	.34					
9.5	63	9.41	77	8.86	.55	86	9.92	79	9.14	.78					
10.5	49	9.94	70	9.76	.18	75	10.29	91	10.01	.28					
11.5	60	10.82	50	10.1	.72	94	11.35	84	10.81	.54					
12.5	66	10.9	61	11.3	G .4	95	11.88	96	12.16	G .28					
13.5	56	11.97	42	12.07	G .1	56	12.2	76	12.11	B .09					
14.5	13	11.79	12	11.67	B.12										

with the writer an investigation into sex differences in the maze test, using two specially devised adult tests and the 13-14 year test of the original series. The subjects were high school students to the number of 682 and ranged in age from 13 to 19 years. The results showed that in the 14 year test the girls had, as regards accuracy, a worse average record than boys in every age group excepting 18 and 19 years. In test "Adult I" they had worse average records than boys at each age except 14 years. For test "Adult II" their average records were distinctly worse except at age 15 years. Adding together the trials in the three tests the girls showed an inferior record for each age group. As regards speed the girls had inferior records for each test at every age.

The conclusion seems inescapable that girls are, on the average, inferior to boys in the capacities measured by the maze tests.

What these capacities are may be judged by the correlations obtained in another investigation wherein a group of defectives were rated for various personality defects and their ratings compared with mental test results. It was found that lack of planning capacity correlated highest for both sexes with inferior success in the Porteus test. Irresolution —the tendency to become easily confused when faced with a new situation—together with simpleness and suggestibility, had the next highest coefficients. Hence it seems fair to conclude that the girls owed their inferior average record to their greater tendency to lack planning capacity, to become easily confused and to yield more easily to suggestion.

In the investigations most recently undertaken the chief points of interest that have arisen are the question of the relation of Porteus age to Binet age, the diagnostic value of

the maze tests and their special application to the psychopathic or the mentally unstable.

Light is thrown upon these questions by a comparison of the average Binet and Porteus scores of the various groups of our last investigation, which deals with 464 defectives. The first part of Table 18 gives the results for the three well-adjusted groups—those below 55 I. Q., those between 55 and 75 I. Q. and those above 75 I. Q.

For these cases it will be seen by the figures that the higher the mental age of the group the more the Porteus average score tends to exceed the Binet. In other words, the nearer the child approaches normality the more planning capacity, resolution, resistance to suggestion, and mental alertness he tends to show. His improvement in these regards, as indicated by his approach to normal standards in the Porteus tests, is more marked than his improvement in memory, verbal comprehension, vocabulary and other capacities as measured by the Binet. Hence the exceptional diagnostic value of the maze tests. For a child with a Binet I. Q. about the critical level—say from 65 to 75 I. Q. —the proof of the possession of planning and executive capacity, prudence, etc., may be all-important as regards the diagnosis of his potential social condition. Hence we consistently use the Binet-Porteus average as a diagnostic measure. It is infrequently the case that a child with a Binet-Porteus average I. Q. below 75 proves socially competent, except under special circumstances of social control and guidance. More evidence in support of the use of the composite Binet-Porteus age as a measure of intelligence is given in other sections.

With regard to the relation of Binet and Porteus test scores to the forms of instability which are subsumed under

TABLE 18

BINET AND PORTEUS AVERAGES COMPARED

Well Adjusted Groups

Group	Binet Average	Porteus Average	Difference
F. M. Stable below 55 I. Q.	4.77 yrs.	4.32 yrs.	Binet +.35 yrs.
F. M. Stable 55 to 74 I. Q.	7.71 yrs.	8.26 yrs.	Porteus +.55 yrs.
Dull Normal Well-Adj. 75 I. Q. and above	8.8 yrs.	10.4 yrs.	Porteus +1.6 yrs.

Psychopathic Groups.

Group	No. of Cases	Binet Aver.	Porteus Aver.	Difference
F. M. Psychopathic below 55 I. Q.	51	5.01 yrs.	4.33 yrs.	Binet +.68 yrs.
F. M. Psychopathic 55 to 74 I. Q.	34	8.55 yrs	8.34 yrs.	Binet +.21 yrs.
Dull Normal Psychopathic 75 and above	15	11 yrs.	11 yrs.	Equal

the heading "psychopathic tendencies," the case stands somewhat differently, as the second part of Table 18 shows.

From these figures it is apparent that the mental instability as indicated by psychopathic tendencies is reflected in the feeble-minded groups by the relatively low Porteus age. This is considerably lower than the Binet, the difference being most marked for the group below 55 I. Q. By reference to the first part of the table, it will be seen that the psychopathic exhibit an opposite tendency to the well-adjusted. Except in the lowest grade cases, the latter tended to score higher in Porteus age than in Binet. As a diagnostic symptom we may say that distinctly lower Porteus than Binet age may be considered indicative of social or industrial inadaptability, the mal-adjustment being very frequently due to psychopathic tendencies.

TABLE 19

BINET AND PORTEUS TEST AGES COMPARED

Group	No. of Cases	Binet Above Porteus	Binet Below Porteus	Tests Equal
F. M. Well Adj. below 55 I. Q.	171	103	56	12
F. M. Well Adj. 55 to 74 I. Q.	71	28	42	1
Dull Normal Well Adj. above 74 I. Q.	29	4	19	6
F. M. Psychopathic below 55 I. Q.	51	33	14	4
F. M. Psychopathic 55 to 74 I. Q.	34	17	15	2
Dull Normal Psychopathic above 74 I. Q.	15	7	6	2

We may consider the differences between the Binet and Porteus tests not only by a comparison of average scores but by the number of instances in which the Binet exceeds the Porteus or vice versa. The figures in Table 19 make this comparison possible.

In general these results, as may be expected, confirm those obtained by a comparison of the average mental ages. It is only the low grade and the psychopathic groups which show a preponderance of cases in which the Binet is above the Porteus.

The delinquent groups also show the same tendencies to score higher in the Porteus test than the Binet, the relative advantage in Porteus age being greater for the dull normal group than for the group at feeble-minded levels. The figures are given in Table 20.

TABLE 20

BINET AND PORTEUS AGES COMPARED

Delinquent Cases

Group	No. of Cases	Binet Average	Porteus Average	Difference
F. M. Delinquent below 75 I. Q.	50	7.78 yrs.	8.35 yrs.	Porteus .57 yrs.
Dull Normal Delinquent above 75 I. Q.	43	9.67 yrs.	11 yrs.	Porteus 1.33 yrs.

The comparison of the averages of the different groups brings an interesting condition to light. The dull normal well-adjusted boys number 29 with an average chronological age of 16. The dull normal psychopathic number 15 with an average chronological age of 18 years. The average

Binet score of these two groups is widely different, the psychopathic group having a decided advantage. The average Binet mental age is 11 years, as against an average of 8.8 years for the well-adjusted. This shows how little dependence can be placed on a high Binet age if the child is psychopathic. The advantage of the dull normal psychopathic group over the well-adjusted is much less marked in Porteus age, the respective average ages being 10.4 for the dull normal and 11 years for the psychopathic.

The same tendency of the Binet to over-rate the psychopathic is shown by a comparison of the feeble-minded groups. The Binet average of the well-adjusted below 55 is 4.77, of the psychopathic 5.01 years. The Porteus averages are practically the same, 4.32 and 4.33 years. The well adjusted between 55 and 74 I. Q. have a Binet average of 7.71 and the psychopathic an average of 8.55 years, a difference in favor of the latter of .84. The Porteus ages for these groups are, respectively, 8.26 and 8.34 years—again practically equal. (See Table 18.)

INTERPRETATION OF MAZE TESTS

A number of investigations have been undertaken in order to provide a basis of interpretation of the Porteus tests. In each of these studies the correlation method has been used. A word of warning as to the value of the correlation method is appropriate before presenting our results. It is evident that in order to make the correlation of significance care must be exercised in the selection of cases. The relation of tests to any criterion, as, for example, social adaptability, may vary at different levels of intelligence. It would be possible to select a large number of idiots, give

them a test of almost any nature and show a high correlation with social adaptability from which it might be argued that the test is, therefore, a very good one. All that we are obtaining is a correlation between almost total lack of ability in the test with almost total lack of social adaptability, which may be a perfect correlation. No one, of course, would present such a proof of the value of a test, but it is easily possible, by the inclusion of too many low-grade cases, to diminish the significance of the correlations. Many tests have been considered of value because of high correlations obtained in this way. This is the case with the form-board, whose value decreases as it approaches normal levels. In other words, the test has least relation to intelligence just at the point where we require its aid as a diagnostic measure. In order to judge of the significance of a correlation we should know something of the fact of distribution. But it is very rarely possible to ensure a normal distribution of ability unless there are very many unselected cases available. Correlations worked out in schools or institutions are seldom based on a normal distribution. In the normal schools there is a deficiency in the lower grades of ability, whilst in institutions for feeble-minded the selection is restricted as regards the upper ranges of ability. Hence the absolute value of a correlation cannot be determined even though we may know its probable error. With certain groups of cases a lower correlation may be much more significant than a high correlation with a differently constituted group.

What we really require to know is not, however, the correlation of tests with cases showing the whole range of mental ability, but rather the relative value of tests with subjects who are at or about the critical score level—critical,

that is, from the diagnostic standpoint. The effect of restricting the selection of cases to one portion of the distribution may tend to lower the correlation, but this will not matter provided the object of the investigation is to compare the relative value of two sets of tests. A comparison of the coefficients obtained with the same group of cases will give this relative value.

TABLE 21

CORRELATION OF MENTAL TESTS AND ABILITIES OF DEFECTIVES

Males

Tests	Correlation	P. E.
Porteus with Industrial Capacity	.67	.069
Binet with Industrial Capacity	.62	.077
Porteus with Social Adaptability	.55	.086
Binet with Social Adaptability	.5	.094
Porteus with Educational Capacity	.27	.116
Binet with Educational Capacity	.64	.074
Binet-Porteus Average with Industrial	.77	.051
Binet-Porteus Average with Social	.66	.071
Binet-Porteus Average with Educational	.47	.098
Binet with Porteus	.21	.119
Females		
Porteus with Industrial Capacity	.75	.045
Binet with Industrial Capacity	.66	.058
Porteus with Social Capacity	.73	.048
Binet with Social Capacity	.59	.066
Porteus with Educational Capacity	.59	.066
Binet with Educational Capacity	.81	.035
Porteus with Binet	.60	.065

In this investigation, undertaken to provide a comparison between the Binet and Porteus, the cases chosen were almost all of moron grades. At least, only cases with Binet (Stanford) age above eight years were included. They were also above fourteen years, chronologically, so that physical age could affect the correlation only slightly. The subjects were 29 boys and 44 girls who had been in the institution for a long period and whose abilities were well known. Generalized estimates were obtained from Mrs. Nash as to their social, industrial, and educational abilities. The correlations are given in Table 21.

A study of this table makes it clear that, as regards the prognosis of educational progress, the Binet test age has considerably better reliability than the Porteus, but that, as regards social and industrial adaptability, the advantage is with the Porteus test, particularly in the case of girls. The somewhat low correlation of the Binet and Porteus tests confirms the conclusion previously mentioned that they may be well combined as a "battery" of mental tests. It is evident that they are not over-lapping or remeasuring the same capacities. The value of combining the two test ages is shown by the better correlation in the case of boys.

As regards industrial capacity, the results given in Table 21 are confirmed by Miss Elizabeth Ross[1] in an investigation carried on in Scotland at the Baldovan Institution. She gives the following correlations using a combined group of defectives and normals and comparing test results with teachers' ratings for industrial efficiency.

Tapping Test with Handwork.....	r.	.60
Healy Form-Board with Handwork.....	r.	.64
Porteus Test with Handwork.....	r.	.76

[1] "Vocational Tests for Mental Defectives." By Elizabeth L. S. Ross. Studies in Mental Inefficiency. Jan. 1921.

Stanford-Binet with Handwork..... r. .69

The advantage of the Porteus test over the rest of the tests used is fairly well marked.

With a group of defectives at the Baldovan institution she obtained the following correlations:

Stanford-Binet with Industrial Efficiency..... r. .81
Porteus with Industrial Efficiency..... r. .81
Binet-Porteus Average with Industrial Efficiency r. .87

She remarks: "These results, though the cases are so few in number, certainly seem to bear out what Porteus claims; that when the Binet and Porteus ages are combined and the average taken we obtain a better index of industrial ability."

Further proof of the value of the composite Binet-Porteus ages is contained in the sections dealing with the social rating scale and the industrial scale.

PORTEUS DIAGNOSTIC SCORE

Reference has already been made to the fact that certain children score relatively too high by the graded maze tests. Certain psychopathic children with good native ability show to great advantage in a test which does not call for long-sustained effort and attention, or which appeals to some special interest such as the puzzle-solving interest. The same children in the routine and drudgery of every-day life reveal an instability of temperament which is not made apparent in the tests. Certain children in the institution, it has been noticed, carry responsibility for just as long as the task is new and interesting and whilst they are sure of plenty of praise and encouragement. This period of stability extends to as long as a month or two, but it is

found that it is advisable to change the schedule of duties for such a child before he approaches too near the breaking point. The breakdown when it comes is sometimes sudden and complete. In the same way certain delinquents may be trusted for a certain period and carry on exceedingly well until, just when they appear to be well-adjusted, they quite suddenly and thoroughly come to grief. It is not so much that an exceptionally strong temptation presents itself at that time as that there is a certain cycle of activity through which the individual lives and in consequence of which a lower resistance to suggestion is apparent at certain intervals. There is no doubt that some criminals' reformation would be more permanent if at certain intervals they spent a day in jail—whether they were doing well or not. The intermittent sentence is almost as desirable a procedure with certain types as the indeterminate sentence. Frequency of impression as well as vividness of presentation is necessary for certain minds to apprehend a needed moral lesson.

The types of cases who tend to be over-estimated by the tests are mentally alert enough to deal with the situation as soon as they become familiar enough with its general nature. It has been noticed, however, that they will very frequently make a mistake in a test, not because it is at or about the level of their mental ability, but wholly because of heedlessness, over-confidence, or persistence in following their self-determined course of action, even though it is in flagrant disregard of instructions or of penalties. Such children frequently fail in tests very much below the level of their general ability. In other words, there is a kind of "scattering" in the Porteus test which is probably as signifi-

cant as in the Binet. There is, however, an essential difference. "Scattering," or failure in tests much lower than the test age level is, in the Binet, due to an intellectual inability to do tests of a certain nature. Failure in a Porteus test much below the mental level is, however, not due to an actual inability to pass the test. As the tests remain of the same nature throughout, this is shown by the subject's ability to compass the higher tests. It indicates a habit of careless, heedless action, an over-confidence in one's powers, or an extremely impulsive temperament. It must not be forgotten that the tests are tests of temperament plus intelligence. The novelty of the test and its intellectual element often excites the subject's interest so that he has every incentive after an initial error to alter his procedure. In the drudgery of every-day tasks this intellectual element is frequently not present, the situation soon loses its novelty and interest, and the temperamentally unstable subject rapidly becomes maladjusted to his task.

Hence, because in social prognosis it is habitual reactions that we are concerned with, and not spurts of activity, it is important for us to weight very heavily these failures in tests much below the subject's mental level, and thus to devise a system of penalties for "scattering." This is in addition to penalties already given under the ordinary scoring conditions for second trials wherever they occur. The rule that we now use is founded on a recognition of the importance of these initial errors. This importance may be indicated through an examination of the classification of the children in whose records they appear. We have examined the test sheets of 470 of our cases with a view to discovering the percentage of children whose second trials or failures occurred well below their mental level. Out of the 470

cases 74 cases, or 15.7 per cent., required second trials in tests three years or more below their ultimate mental level or failed completely in tests two years or more below their mental level. Of these 74, 31, or about 42 per cent., belonged in the well-adjusted group, 21, or 28.4 per cent., belonged in the psychopathic group, and 22, or nearly 30 per cent., in the delinquent group. These figures show a decided disproportion as regards both the delinquent and psychopathic cases, considering that the well-adjusted so out-number these other two classes. 312 of the 470 cases belong to the well-adjusted group, as against 77 delinquents and 81 psychopathic. The number of well-adjusted who showed this scattering made up only 19 per cent. of the total well-adjusted, and in almost every case they were cases who were over-rated by the test. Ninety-three per cent. of the well-adjusted group who scattered had Porteus ages in advance of their Binet.

Of the 81 psychopathic tested, 34, or 42 per cent., scattered to the extent of having second trials in tests two years or more below their test age. Of the 77 delinquents recorded, 51 per cent. scattered to this degree.

TABLE 22

SCATTERING IN PORTEUS TEST

Failures Below Mental Age

Group	2 yrs.	%	3 yrs.	%	4 yrs. or more	%	Total Scattering
Well Adjusted	27	5.6	16	5.1	15	4.8	16%
Psychopathic	13	16	15	18.5	6	7.4	42%
Delinquent	16	20.8	14	18.2	9	11.7	51%

Table 22 gives the total number and percentage in each classified group whose test results exhibit scattering. Its lessened frequency in the well-adjusted may be gauged by the smaller percentages in every column.

The adjustment that we have devised for this scattering is shown in the following scoring plan. The resultant age—after the deductions have been made—has been termed "the diagnostic score."

Deductions from Mental Age.	Amount of Scattering.
1 year	Complete failure in test two years below mental age, or second trial in test 3 years below mental age.
2 years	Complete failure in test 3 years below mental age, or second trial in test more than 3 years below mental age.

These deductions are cumulative—that is to say, a child who, for instance, tested 12 years but required 2 trials in the 6 year and 2 trials in the 9 year test will incur a deduction of 3 years from his mental age. The score will, therefore, be 12—3=9 years. The child with mental age 8 who failed completely in the 6 year test, scored 8—1=7 years. The latter rating is the diagnostic score. Generally speaking, the diagnostic score has a closer relation to the social adaptability than the original mental age. Taking a hundred cases for whom social rating indices had been allotted it was found that, whilst the original Porteus age correlated .67 with the social rating, the diagnostic score correlated .72 with this measure of social adaptability.

It occasionally happens that an individual will score a success in a test three years or more above his mental age. In these cases we add two years to his mental age. Out of

the 470 cases in the group at present under review, this addition was only earned in two cases. In each of these cases, however, the mental age rating was manifestly low in comparison with the social rating.

As a general conclusion, it may be stated that scattering in the Porteus test is characteristic of certain psychopathic and delinquent children and of children somewhat overrated by the test. The diagnostic score serves to distinguish these children and is a useful measure of their social adaptability. Scattering is not characteristic of all the psychopathic or delinquent as it frequently happens that children of these types have already scored very low in the maze test in comparison with other tests.

THE INVERTED MAZE TEST

In order to analyze still further the children's responses to the maze test, Miss Flowers, research assistant at Vineland, reapplied the tests to a group of 223 cases all of whom had been examined within a period of eighteen months. Because of the "repeated trials" plan of procedure, a great deal of practice is given in working through the series. As a consequence, when the test is reapplied it is no longer a new situation to a child, so that, unless he is of a low level of intelligence, he usually succeeds much better in the second testing. In order to obviate this advantage the tests were inverted by Miss Flowers when giving them to the child. The same number of trials was given, but immediately the child failed in a single test the examination stopped. Then, in counting up the score, a full year's credit was deducted for every test passed on the second trial. By this method of scoring 75 males scored less with the inverted

tests than they did at the first test. Of this group of 75 cases, 41, or 54.6 per cent., belonged in the delinquent or psychopathic groups. Of these 41 cases, 24, or 58.5 per cent., were delinquent and 17, or 41.5 per cent., were psychopathic. Here again, as was the case with scattering, there is a disproportion in the number of maladjusted as compared with the well-adjusted, the latter making up by far the great majority of those tested. Hence, we can state another tendency in the delinquent and psychopathic: they tend to score lower in the inverted test than in the original presentation. In other words, they show an impulsiveness and lack of caution out of proportion to their general level of intelligence. Despite their mental alertness, they do not readily carry their previous experience over to a similar situation. In other words, their power to profit by experience is immediate only in its operation. Their poor record in the inverted test is not so much an expression of their lack of intellectual ability, but rather of their habits of impulsive action.

The distinction between the two classes of failures should always be kept in mind. The definitely defective most often fail in the test because they lack the intellectual capacities involved in the test. The delinquents, and often the psychopathic, fail because of their temperamental incapacities. The additional practice afforded by the second application affects the intellectual factor, the mental adjustment. Hence the well-adjusted tend to score as well or better because of practice effects. The temperamental incapacities of carelessness, over-confidence, are, however, comparatively unaffected by practice. Hence, the delinquent and psychopathic of certain type tend to repeat their error and the severer system of scoring adopted in the inverted test gives them a lower rating. With girls the same ten-

dencies are apparent, 34 out of 68, or 50 per cent., scored less by the inverted series than by the original. Of these, 20, or about 59 per cent., were delinquent or psychopathic, the proportions being 15 delinquents and 5 psychopathics. The larger number of delinquents failing as compared with the psychopathic in both girls and boys is quite understandable in view of the tendency, already pointed out, for many of the psychopathic to score low in the original test. Hence, they are all the less likely to have a still lower score in the inverted series. As an additional check on both the Binet and Porteus maze tests we recommend the use of a new form and assembling test which is described in another section.

Instead of comparing the psychopathic and the delinquent with the well-adjusted, we may wish to know what percentage of all the psychopathic and delinquents showed the tendency to score lower in the inverted test. Of the 68 girls who were given the inverted test, 9 were classified amongst the psychopathic, and of these 5 scored less by the inverted test. This is equal to 55 per cent. Of the 155 boys examined, 31 were psychopathic and 16 of these scored less. This is equal to over 50 per cent. Of the 19 delinquent girls included in the group, 15, or 79 per cent., scored less by the inverted test. The delinquent boys numbered 39, and of these 24, or 61 per cent., scored less. If the examiner wishes to observe still further the reaction of individual children after a first testing the inverted test may be recommended. On the whole, the scores by the inverted series correlate somewhat similarly with social adaptability, as do the tests when originally given.

It should be pointed out that a disadvantage of the maze series is that because of practice effects they cannot

be safely reapplied to the same children. This is, of course, not true of the Binet, which may be reapplied without largely affecting the child's test record. This disadvantage is probably characteristic of many performance tests, but is particularly so of the Porteus maze test.

In order to facilitate the use of the maze test by enabling its results in individual cases to be compared with the distribution of scores of an unselected group of the population we are publishing a percentile table for Porteus I. Q.s. This table is based on results obtained from 1000 school children ranging in age from 5 years to 14 years. It will be seen that the median is at an I. Q. of 97, the 10 percentile at approximately 80, and the 90 percentile at 120 I. Q. The table is numbered 23.

TABLE 23

PORTEUS I. Q.S.—PERCENTILE TABLE

Percentile	0	10	20	30	40	50	60	70	80	90	100
Porteus I. Q.	48	79	85	90	94	97	101	105	112	120	174

CHAPTER V

PERSONALITY TRAITS

PRINCIPLES OF SOCIAL RATING SCALE

There is no doubt that Binet's great work has ushered in a period of tremendous interest and activity in the field of mental tests. This activity has, in America, not yet passed its maximum, if one may judge by the numbers of tests which are being devised and applied to hundreds of thousands of cases. Naturally, psychologists in devising these tests have taken the path of least resistance. Immediately psychometry or mental measuring was made possible by standardized tests attention was paid to those capacities which are the most easily measurable. For example, in the Binet series a great deal of emphasis was placed on rote memory which could be easily tested in terms of the number of words or digits or ideas which could be repeated by the subject. Ease of application and scoring influenced the choice of other tests such as recognition of coins, and knowing the days of the week. Tests of language comprehension and range of ideas were also used. If one passes the Binet series of tests in review it will be seen that there are very few tests of a really novel nature. The influence of the school examination and the laboratory examination can be easily traced throughout the whole series. In other words the single tests were not by any means original; it was Binet's formulation of the theory of mental levels and the standardization of the tests to suit these levels that comprised his main contribution to mental measurements.

Performance tests were the next to be developed largely because of the demand for non-language tests or for tests of a concrete nature more suitable for children of defective levels of intelligence. In most of these tests the aim is to test intelligence by measuring the amount of work involving certain mental functions which could be accomplished in a given time. Other tests take account not of speed but of accuracy. The advantage of these performance tests is that they allow the examiner the opportunity to watch the subject at work and in that way to arrive at conclusions regarding the adaptability of his methods and his habits of working. Because the results are affected by so many non-measurable factors it is more difficult to give a value to a child's response in terms of mental age. A merely quantitative measure such as speed of working takes account of much fewer important factors than does a test of quality of workmanship. For this reason it is probable that tests involving accuracy will continue to be better for founding social prognosis upon than those which take account of the rate of working only. This statement at least holds true for children at defective levels of intelligence. It has been previously pointed out that the choice either of the best material or of the best scoring method of diagnostic tests is not affected by conclusions arrived at in investigations using children above defective mental levels, or which adopt criteria of intelligence that do not bear directly on the social adaptability of defectives.

But even supposing that it is possible by a combination of performance tests and tests of the Binet type to obtain a satisfactory measure of intelligence it must not be forgotten that there are other factors besides intelligence that have an important bearing on the social adjustments of the individual. Not only is it necessary to judge of the individual's

memory and reasoning power, of his speed and accuracy of working at tasks involving intellectual factors, but we require to judge of his ability and willingness to exercise self-control and self-management to such a degree as to make himself socially sufficient. In other words, judgment and reason operate in a larger field than in the purely intellectual. Personality, as Warren points out, includes as main factors intellectual development, temperament, skill and morality. Defects in any or all of these may render the individual socially inefficient. Admitting that we have progressed some distance towards the measurement of intellectual development we must still acknowledge that tests which will give us any adequate estimation of the other factors are so far lacking.

Up to the present in all doubtful borderline cases we have been reduced to using the world as our laboratory for determining social fitness—a plan which Pearson[1] calls "the experimental method of testing actual success or failure in the rough and tumble of life." The final appeal in doubtful cases is not to the subject's test result but to his everyday conduct. Personality must be judged for what it is worth in social relations. The difficulty lies in the application of scientific observation to the problem. What traits in the every-day conduct of the defective should be looked for, and when found, what is their relative importance, and how are they to be estimated? If we can give an answer to each of these questions then the chief difficulties in the way of a scientific rating of personality will be overcome.

At first sight both the selection of traits and their relative weighting present almost insuperable difficulties. In the first place there is a great number of traits which go to

[1] "Mendelism and the Problem of Mental Defect. III." By Karl Pearson. 1914.

make up personality. Some of these are of occasional, others of more general appearance in individual life history. Changes more or less significant in our emotional conditions in our moods, our character, are registered in response to changes in our environment. But the thermometers of personality are cast in various moulds and calibres so that the degree of response to environmental conditions differs greatly in different individuals. The psychopathic person resembles a glass of very small calibre so that comparatively small causes register great changes in conduct. The extremely phlegmatic, impassive or stuporous type is one in which the mould is so expanded as to allow even the grossest environmental changes to go practically unregistered.

Now if this were the only difficulty it might perhaps be surmounted. To carry the parallel between the thermometer and personality further it would only be a matter of observing the relative changes in temperature registration to obtain an estimate of the calibre of the personality. Unfortunately the matter is not so simple. We must imagine too that our thermometers are filled with fluids of different densities and hence with different sensitivity to atmospheric pressure and variables other than temperature. In other words the strength of a character or the nature of a personality depends not only upon the varying strength of instinctive activities but upon the varying strength of the inhibitions which we develop. Conduct is the result of a constant interplay of instincts and inhibitions which are themselves affected by a complex of inherent and environmental factors. The aim of intelligence tests is to measure only one portion of the field of activity. The scientific observation of every-day conduct would give us a social index of far wider significance.

The problem is narrowed greatly immediately we direct our studies to subnormal personalities, viz., to those in whom the social maladjustment is most apparent. Intelligence tests have been comparatively successful as a gauge of social adaptability only when they have been applied to the lower levels of intellectual ability. To argue that, because certain famous men as children would probably not have made a good showing with some of our intelligence tests, the tests are therefore useless involves a mistaken inference. We know that these men would never have tested at defective levels of intelligence and it is admitted that in the matter of adequately testing intelligence much above these levels not much progress has been made. Whilst it is a comparatively easy matter to measure the immature mind, our tests are not sufficient to measure a mind of normally mature development. From these considerations we may learn a useful lesson in attempting to devise personality scales. By limiting our personality studies to the sub-social we greatly simplify our problem. A foot rule would serve exceedingly well to measure a short distance but it would be an impracticable instrument for measuring a mile. To employ another simile, the aim of a personality rating scale should be to provide a test of specific gravity which will determine whether an individual will float in society, but will not tell us how high he will float above the surface. The study of normal personality would involve a balancing of all kinds of positive and negative factors in a most uncertain way. In the case of the social inefficient we need only take account of the causes of failure. If the ship's hull be so leaky that it must soon sink it is of little concern to know how much sail it carries or whether the masts are strong or whether the lines of its keel are even. Similarly as regards normal suc-

cess in the community a man's perseverance, his good humor, and his sense of personal dignity may be valuable assets, but persistence, self esteem and cheerfulness in a defective only serve to throw his defects into stronger relief.

It is plain that these qualities are of great importance when, as in a normal person, they are balanced by good judgment and common sense. When the latter are wanting the otherwise good qualities only serve to deepen the shadows of social inadequacy. In the same way what are positive hindrances in an ordinary mortal may be assets when associated with genius—as, for example, egotism in a Napoleon. Hence it will be apparent that when we are assessing the causes of failure it is hardly necessary to take account of positive qualities which under ordinary circumstances make for success. In other words the social rating scale for defectives aims at measuring the leaks in the ship's hull rather than the spread of its sails.

In the next place it is not necessary to take account of all the defects in personality even of defectives. Those which are of occasional appearance are not considered. In a scale which has a diagnostic purpose the attempt to analyze the character too minutely is akin to measuring the pin holes as well as the rents in character—an unnecessary proceeding.

Another consideration involves specific delinquencies. By this we mean an abnormally developed instinct or a subnormally developed inhibition operating in a specific but limited direction, as, for example, an abnormally developed sex appetite or some other specific moral weakness, such as kleptomania. Our rating scale only takes account of delinquencies in so far as they are the expression of general inadequate personality. Specific delinquencies such as habitual drunkenness or nymphomania are sufficient to mark the per-

son down at once as socially insufficient. To apply a scale summarizing the general weaknesses of character or personality to such cases resembles the statement regarding the soldier who was said to have received eleven wounds, all of which were fatal.

The application of this scale, not to all classes of social inefficients, but merely to subnormal personalities means a decided advantage in the matter of reducing the difficulty of obtaining proper estimates of personality. The means of measuring intelligence are already provided in intelligence scales whose verdict will, of course, be used to supplement the social ratings. Skill—the second factor in Warren's analysis—as evinced by the defective is of a simple order. The range of occupations in which he can function is narrow and his progress in these occupations is slow and thus the more readily observed and rated. The planning capacity, too, that is possessed by the defective is not planning capacity of a high order but can be rather easily assessed by observing his method of attack on a simple task. Thus the chief factor in self-support can be taken account of. Morality is the third factor in Warren's analysis of personality. The morality of defectives is not founded upon such a complex of motives and inhibitions as is that of a normal. The immorality of defectives—including specific delinquencies—is the immorality of children, a matter largely of suggestibility, impulsiveness, foolishness or stubbornness. Their lying is usually clumsy and the planning of their misdemeanors is not characterized by any great foresight, initiative, or resource. In other words their immorality has as its basis immaturity of judgment and lack of intelligent self-regard. In this connection we would remark that we have never seen a moral imbecile, meaning by that a person

whose only distinguishable defect is a lack of so-called moral sense. Such a deficiency, either partial or more general in scope, is sometimes apparent among the psychopathic but there seems no reason for coining such a special and poorly descriptive term as "moral imbecile."

The limiting of the scale to negative characteristics also increases the ease of assigning ratings. It is far easier to rate in terms of inefficiency than of efficiency. A comparatively simple drill exercise will suffice to enable us to select the comparatively inefficient amongst military recruits. Tests of a far more searching nature would be required to enable one to rate officers correctly. Generals probably stand further from one another as regards military efficiency than do captains but it requires an exceptional test such as war time conditions to show up the individual differences in capacity of generals. In the same way the difficulty of obtaining accurate ratings in regard to defectives is much less than if normals were under consideration.

In addition to this there is an added reliability attached to the rating of defectives because they have been so long under control and observation. Many of the defectives who formed the basis of our study have been in the institution for from five to twenty years and their characteristics were as a consequence very well known. This intimate knowledge is only possible in an institution. In clinical practice the individual passes so quickly out of the field of vision that we cannot in many cases measure our prognosis against actuality.

A final advantage that we enjoyed in devising the scale lay in the fact that not only did the judges have a long and intimate acquaintance with the cases but were also practised in the giving of ratings.

Because of these various considerations our scale tended to be free from certain objections that have been advanced against rating scales in general. One of the most serious of these is that pointed out by Thorndike. He shows that ratings of individuals tend to be influenced very largely by an "aura" or "halo" which surrounds each person and which affects people's judgments of his personality. In other words the tendency is to form a generalized opinion of a person—that he is very superior, or average, or inferior, as the case may be—and then make all our separate ratings similar no matter under what heading or with regard to what traits they have been given. This tendency was well illustrated by some personal ratings of army officers. The ratings showed a suspicious sameness no matter how disparate the traits to be rated were. For instance "physique" correlated just as highly with military efficiency as did intelligence. Manifestly intelligence would have the more direct relation to military efficiency. This sameness of ratings was, however, not so apparent as regards the social rating scale. This was due evidently to more accurate observation and rating of the traits of the scale. All the ordinary safeguards such as the comparison of one judge's ratings with another's, and the comparison of two sets of ratings given by the same judge with a period of time between have been employed to test still further the accuracy of the ratings given. Before proceeding to the detailed description of the social rating scale we may summarize the considerations which made for the simplifying of the problem.

1. Limitation of the application of the scale to the sub-social so that the scale is one for rating social inefficiency rather than social efficiency.

2. Limitation of the application of the scale to

defective social inefficients, viz., to those whose social maladjustment is due to a more or less general inadequacy of personality and not to those with specific or occasional delinquencies.

3. Confining the selection of the traits to be judged to defects. No attempt is made to analyze the good points in personality since they cannot make up for essential deficiencies.

4. Limitation of the number of the traits to be rated to those which are most important and most characteristic of defectives.

5. Choice of judges of long and intimate acquaintance with the subjects.

SELECTION AND WEIGHTING OF TRAITS

In this section will be described the means taken to select and weight the traits of the social ratings scale. In order to discover the traits which are most characteristic of defectives a list of about fifty anti-social traits was selected. To obtain this list we searched the literature dealing with the every-day conduct of defectives and selected the terms which indicated anti-social or asocial tendencies. This list contained such terms as suspicious, selfish, vain and conceited, inactive, mischievous, careless in work, insensitive to criticism, imprudent, over-emotional, over-sensitive, lazy, secretive, bullying, cruel, violent, quarrelsome, moody, egocentric, sly and deceitful, etc. Then a list of 125 names of defectives who had been at the Training School for periods exceeding five years was submitted to two judges. One of these judges was Mrs. Nash, who has been for twenty years director of the school training and is also

director of the industrial work. Under the Training School plan children pass through the school where they are given simple instruction in the reading, writing, spelling and arithmetic as far as they can assimilate such training. The pupils are at the same time undergoing various courses of manual training which includes needlework, cooking, basketry, woodwork, brushmaking, mat and rug weaving, and shoe repairing, together with work on the school farm.

After this period of training they are drafted into the various industrial occupations in the institution at large, the effort being to schedule the child to the occupation for which he is best fitted both by training, interest, and temperament. This industrial scheduling of the children is subject to constant review in the light of the child's conduct and progress. Some children become readily adjusted and tend to remain in the occupation for which they were trained. Others are tried out in many and various fields of labor until at last they find the niche they can fill with a maximum degree of usefulness and satisfaction. For the consummation of Professor Johnstone's ideal of happiness through development, the most careful and constant watchfulness must be exercised and the child must be studied from many angles. The industrial placement of a child is a real problem in applied psychology. Mrs. Nash, as the result of her long service has had an unexcelled institution experience and is eminently fitted to judge of the characteristics of the child.

When an individual is admitted to the institution he must first go to the hospital for a period of some days. Here he is watched to see that he is not in the incubation or developing period of any infectious disease. Here, too, his characteristics and habits are noted. The other judge whose

estimates were obtained, mainly as a check on those given by Mrs. Nash, was Mr. Arnade, supervisor of the hospital service, who has also had ten years' experience as supervisor of the boys' cottages and thus knows the inmates very well from the social viewpoint. Finally the cottage in which the boy is placed is decided on by a committee consisting of Mrs. Nash, Mr. Arnade and one of the laboratory staff who has conducted the entrance examination. Because both Mrs. Nash and Mr. Arnade know the cases intimately but from somewhat different angles—the former from the standpoint of their educational and industrial aptitudes, the latter from their social characteristics—it was thought that both of these officers of the school could be depended on for the giving of reliable judgments. They had previously been practised in the giving of ratings in connection with an industrial scale.

These two judges were therefore asked first to indicate which of the 50 characteristics listed were possessed individually by the 125 cases submitted to them for judgment. They were instructed to disregard the very occasional or rare appearance of a trait. As an example, a boy had very occasionally in a long term of years showed apparent suggestibility by being persuaded to run away from the institution. Even though this might be considered a serious occurrence the judges were asked to consider the circumstances surrounding the event and to determine whether a normal motivation and not suggestibility did not lie at the back of the action. If so, then he was not to be rated as suggestible.

The comparative frequency in which the traits were observed was then computed. It was found that the traits most characteristic of this group of mental defectives were in order:

Slyness and Cunning
Resentfulness of Criticism
Suggestibility
Irresolution
Over-emotionality
Lack of Planning Capacity
Impudence
Simpleness and Childishness
Disobedience
Secretiveness
Lack of Perseverance
Nervousness
Laziness
Quarrelsomeness
Dependency
Impulsiveness
Moodiness, etc.

It was found that by combining certain closely-related traits into groups this number could be greatly reduced. Finally, the following list of traits was chosen as being the most characteristic of the conduct of defectives. The traits are given in their approximate order of frequency:

1. Bad temper, quarrelsomeness, over-resentfulness of criticism.
2. Lack of planning capacity.
3. Simpleness and suggestibility.
4. Slyness, cunning and deceit.
5. Impudence, disobedience, disrespect for authority.
6. Irresolution, mental confusion.
7. Nervousness, over-emotionality.
8. Impulsiveness, imprudence.
9. Lack of volition, dependency.
10. Moodiness and obstinacy.
11. Silliness and obtrusiveness.

In considering this list it was at once apparent that the order of frequency was not the order of importance from the standpoint of social adjustment. Whilst bad temper, for instance, was most frequently observed, yet the quarrels that resulted were usually unimportant. The feeble-minded do not, as a rule, harbor a grudge. A simulation of rage is frequently purely a defence reaction and an attempted concealment of weakness. In most cases the quarrels of idiots are like their tales, "full of sound and fury, signifying nothing." They threaten mightily, but perform little. Assaults except by the delinquent or psychopathic are petty affairs and are conducted usually on the hit-and-run plan. On the other hand, obtrusiveness and silly egotism, whilst not found very widely distributed amongst defectives in an institution, attract the observer's notice so readily when they do occur that they form one of the most easily recognized symptoms in some mentally deficient persons. Undoubtedly the loud laugh very often betokens the empty mind.

Similarly impulsiveness is not given its right order of social importance. In a simplified environment such as an institution affords, the social results of impulsive action are slight, yet if the individual were outside they might be very grave. Resentfulness to authority, though a common fault, is the resentfulness of a child, not of an anarchist. It will be seen from these observations that the determination of the frequency of defects helps us very little to the realization of their comparative importance. The frequently observed small faults of disposition may not be at all the gravest social defects.

Accordingly, in order to determine the relative importance of these groups of traits, each individual was rated independently by the two judges according to his degree of possession of traits listed. This rating was given on a three-

point basis, the plan followed being that devised by Scott for rating personnel in the U. S. Army. An individual possessing the trait to excess was first selected from the group and given a rating of three points. Next an individual was selected in whom the trait appeared to a very minor degree and he was rated one point. A rating of two points was then allotted to an individual falling about midway between the two already selected. These three cases then provided a scale in comparison with which all other individuals in the group could be rated. The chief advantage of this over an ordinary system of assigning ratings is that it helps to ensure a proper distribution of marks. Some judges tend to give too few ratings at one or both extremes whilst others have a reverse tendency. The necessity of having to compare each individual in the group with the selected three makes for more accurate markings.

Having obtained ratings regarding these traits on all the group we next required a measure of social adaptability as a criterion with which the ratings of individual traits could be correlated. Accordingly the judges were asked to assign a rating on a five-point basis to all the individuals. This rating was based on the judge's estimate of the comparative ability of the individual to get along in the community if dismissed from the institution.

Tests were then made of the reliability of the judges' ratings. As the girls had been rated by Mrs. Nash a coefficient of reliability index was obtained from two sets of ratings given by her on the same individuals with a month's interval elapsing. The correlation between the two sets was .87. Considering that the Scott plan of rating was not used for the first of these sets this correlation was regarded as sufficiently high.

As a second proof of reliability, Mrs. Nash's and Mr. Arnade's ratings over a group of 43 boys were correlated with a resulting coefficient of .85.

The next step was to correlate the ratings in the single characteristics with the general estimates of the individual's social adaptability. From a comparison of the obtained coefficients it was found that, for both girls and boys, lacking planning capacity, lacking initiative (dependency) and irresolution, correlated most highly with social inefficiency; nervousness and excitability, impulsiveness and suggestibility came next, whilst silliness and moodiness came last. Negative correlations were obtained for cunning and slyness, bad temper and disobedience.

It will be seen that these last three groups of traits betoken an activity of temperament possessed only by the brightest cases. Cunning might even be considered an asset in society as it is usually constituted. As before mentioned, bad temper, though frequently observed, is of little importance. Disobedience often betokens the natural impatience of the high-grade individual with a feeble-minded institution's environment. Amongst the most successful of the trainees of the school are those who showed initiative, purpose and independence by running away. Chronic running away is, in most cases, a merely psychopathic action, but in other cases where it is well planned it is an evidence of comparative normality. Indeed, it is often said of an individual whose mentality is in question, "He must be feeble-minded or he would run away." In an institution where not a door is locked nor any special precaution taken to guard the inmates it would be the easiest matter to obtain freedom. Only the most intelligent, however, can retain their freedom once they have obtained it.

As a consequence of the negative correlations the above mentioned three groups of traits were omitted from the scale. An indirect proof of the fairness of the ratings is found in the fact of the dissimilarity of the correlations. Judges intimately concerned with the problems of discipline in an institution, when estimating social fitness, might be expected to exaggerate the importance of disobedience and other similar traits. Another possible objection to the scale as a whole is that planning capacity will naturally have such a high correlation with the general social estimate that the addition of the six other groups of traits does not add materially to the value of the scale. The correlation of this trait with the general social estimate is for girls .85 and for boys .77. As the boys' correlation between the social rating index and the general social estimate was .87 it will be seen that this objection does not apply in their case with the same weight as it does in the case of girls. The objection, however, to using planning capacity alone as a measure of social adaptability instead of the whole scale lies mainly in the fact that the agreements between less experienced judges' estimates on a single trait is not as marked as it is for the composite rating by the whole scale. Not only is this the case, but the general social estimates of a number of less experienced judges were found not to inter-correlate as well as did their social rating indices, showing that the latter is for a single judge more likely to be correct than the more generalized judgment. This matter will be referred to in a later section.

On the whole, while it was observed that ratings on certain traits inter-correlated highly, other traits more dissimilar in nature had much lower correlations. Altogether there was a sufficient range in the coefficients.

However, lack of planning capacity and lack of initiative and dependency not only correlated very highly together (.86), but also very similar correlations were observable between these two and the rest of the groups. It was evident, therefore, that the two traits were not separated in the minds of the judges and that nearly identical ratings were being given. It was determined, therefore, to combine these two groups under one heading, "Lack of planning capacity and executive ability."

In order to discover the relative weighting which should be attached to ratings given under the individual traits an experimental analysis of correlation results was undertaken, with the result that the final weighting of the traits was as follows:

Trait	Weighting
1. Lack of planning capacity and executive ability	6
2. Suggestibility	3
3. Impulsive or imprudent	2
4. Nervous or excitable	2
5. Silly or obtrusive	2
6. Irresolute, easily confused	2
7. Moody	1

The sum of the weighted social ratings, referred to hereafter as the social inefficiency indices, were then correlated with the general social estimates. The coefficients were quite satisfactory, .89 for girls and .88 for boys. Allowing for errors in observation, these coefficients are quite as high as can be expected. That the errors in observation were not large can be judged by the fact that the indices obtained from Mrs. Nash's ratings correlated .87 with those obtained from Mr. Arnade.

In order to meet the possible objection that as the

ratings and social estimates were both given by the same person they would naturally tend to coincide, we cross-correlated Mrs. Nash's ratings on the boys with Mr. Arnade's general social estimates, the coefficient being as high as .85.

It is perhaps necessary to reiterate that the scale may not apply to many delinquents and psychopathics. The intended scope of application of the scale may be gauged by the following quotations from a previous publication.[1]

"The social rating scale takes no cognizance of thieving and sex propensities which may be the result of an actively anti-social attitude, due perhaps to the unwonted strength of unsatisfied instincts. It is when the person steals because he is industrially incapable or the girl becomes sexually immoral because of simpleness and suggestibility or unrestrained impulsiveness, or because she invites temptation by a foolish obtrusiveness that the scale begins to apply. The particular form of immorality is in such cases dependent on the environment, but is also the expression of general mental or temperamental inadequacy. Although the scale does not pretend to plumb the whole sea of social maladjustment, it may still have a value in that it gives us a line of soundings of depths beyond the already charted limits of mental tests."

The relation of the scale to psychiatry may be gathered from the following passage: "In so far as this study deals with personality it belongs in the psychiatric field. But here again the social rating scale has a limited application. A person's psychopathic condition may become apparent through the extreme exaggeration of some particular trait which dominates an otherwise normal personality, just as another person may become delinquent through the

[1] "Study of Personality with a Social Rating Scale." By S. D. Porteus. Research Publication No. 23. Training School at Vineland.

possession of one compelling propensity. For such cases a social rating by the scale would have little meaning, because no adequate means of weighting the trait or propensity is possible. Many murderers, no doubt, would have excellent social ratings.

Consequently, very little use has been made of the terms of psychiatry, and no classification of the various types, such as egoistic, fatuous, shut-in, psychopathic inferior, etc., has been adopted. The terms used in the scale are those employed by social workers, teachers and others not specially trained in psychiatry. The only term that has been borrowed is "obtrusive," and that because it gives such an excellent description of feeble-minded behavior.

It may be that the psychiatrist or criminologist will find the scale somewhat useful as a means of gathering the evidence upon which certain psychiatric characterizations depend. That the scale does not pretend to cover the whole field of psychiatric behavior will not render its actual value any the less. The defective socially maladjusted demands the attention of the psychiatrist, just as the defective delinquent is also the concern of the criminologist. The addition of the term "defective" to the description is only half the diagnosis.

It may be noted, however, that the prevalence of mood-disturbances, impulsive judgments, childish reactions, easy suggestibility, inability to cope with new situations, nervous irritability and obtrusiveness are all characteristic of the seclusive, fatuous, obtrusive or egocentric temperaments and are reflected in the headings of the scale. In a series of excellent and illuminating case histories of mentally inferior, psychopathic prostitutes, by Dr. Walter L. Treadway, the terms used in our scale are given again and again as

Psychiatric Studies of Delinquents. By Treadway, Weldon and Hill. Public Health Reports, 1920.

descriptive of the salient features of the behavior. Inability to plan new work or shape situations, suggestibility, child-like emotional activities, impulsiveness, nervous excitability, easy "stimulability" appear as the outstanding asocial features of these cases. Disrespect for authority, over-sensitiveness, violent temper, which we have found to be characteristic of the feeble-minded, were also present in many."

APPLICATION OF SOCIAL RATING SCALE

One difficulty which was met in proving the applicability of the social rating scale was that comparatively few of our cases had been tried out in the community. Consequently the estimates of social adaptability with which the ratings were correlated were *only* estimates, although because of the experience of the judges they probably had a high degree of reliability.

In the next place, it was uncertain whether the scale could be as successfully applied when used outside our own institution where the judges available might have had considerably less experience than the ones we employed. We therefore decided to try the scale out under conditions entirely new to the investigators. Permission was very courteously granted by Mr. Thorne, Superintendent of the State Home for Feeble-Minded Women at Vineland, to undertake a study of a group of 30 girls. These girls were selected by him as being interesting, or problem cases. Ratings were obtained from Mr. Thorne, from two matrons and the parole officer, Miss Yerkes. These ratings were pooled and then correlated with general social estimates given by the same judges, which were also pooled. The

correlation between the pooled indices and the pooled social estimates was .94! The time taken in obtaining the data was less than three hours, so that in as little time as it takes to administer and score a group mental test, a diagnostic measure had been obtained which practically corresponded with the average verdicts of experience gained in a long period of handling and training these girls. The significance of these results was enhanced by the fact that the group contained only high-grade cases, i. e., those for whom diagnosis was most difficult. It was evident from this investigation that the scale was easily applicable under conditions new to the investigator and with judges less experienced, provided their ratings are pooled.

At first sight such a high correlation as .94 would make the scale appear unnecessary. It might be urged that it would be easier to use a general social index estimate than to obtain ratings with the social rating scale. However, when the judges' social estimates were compared it was found that they did not correlate nearly as highly with one another as did their social rating indices. In other words, there was a more decided agreement between the indices than between the general social estimates.

The general social estimate being on a five-point basis, the social ratings were also divided into five groups. Indices 22 or below were rated in Class 1; 23 to 28, Class 2; 29 to 36, Class 3; 37 to 44, Class 4, and 48 or above, Class 5.

These classes respectively indicate (1) the socially sufficient group; (2) socially sufficient cases if given a certain amount of supervision and control on parole; (3) the useful, trainable institution cases; (4) the less trainable institution cases; (5) the institution cases with little trainability and capable only of the simplest routine work.

From the standpoint of agreement between the judges the superiority of the social ratings scale to the general social estimate may be gauged from the correlations given in Table 24.

TABLE 24

JUDGES' INTERCORRELATIONS

	Social Rating	General Social Estimate
Judge A with Judge B	r = .74	r = .64
Judge B with Judge C	r = .75	r = .5
Judge A with Judge C	r = .76	r = .6

From this table it will be seen that there was a much more decided tendency to agreement as regards the social ratings than in the general estimates. This is undoubtedly so because the dividing up of the problem of observation and the consideration of the single traits renders the giving of reliable ratings much simpler. Although for the purpose of this investigation all judgments were given independently by the judges and without any knowledge of the weightings assigned to the traits, there is no reason why people who are using the scale should not consult together. If there is a wide difference in the general social estimates allotted by two judges to an individual there is hardly any basis of discussion to determine which is the more correct. An analysed scale, however, because of its less general and more objective nature, does provide a basis of discussion in the event of disagreement. If, for instance, an individual's rating in planning capacity is in doubt it would be possible to put this to the test by observing him at work. Similarly, if one judge rates a person as being most impuls-

ive, he can present evidence in support of his rating. It is a great deal easier to make an estimate of the number of objects in a group when the group is subdivided into smaller groups. Similarly the partitioning of the problem renders estimates of social ratings more reliable.

It has been observed also that inexperienced judges are very apt to allow recent happenings to weigh too heavily in their estimates of conduct. This factor of recency of impression is less likely to affect unduly a weighted scale than a generalized judgment of social competency.

Another serious difficulty and a point of possible criticism with regard to the scale is that the general social estimates with which the ratings were correlated were not founded upon demonstrated, but rather upon estimated success in the community. This was not wholly the case with the State Home cases, some of whom had been tried out on parole. Admittedly, more reliance might be placed on the scale as regards diagnosis if all the cases had been tried out in the community.

The best opportunity to obtain cases of this sort is undoubtedly at the State School, at Rome, N. Y., where Dr. Bernstein has initiated a most successful system of colony and community parole for defectives. These colonies consist of farms which have been rented or purchased, or, as provided for girls, houses rented in the environs of small cities. To these colonies groups of defectives, varying in number from twenty to forty, are drafted from the parent institution at Rome. A more or less prolonged observation precedes this colony trial. The boys work the farm under the direction of the man in charge or are allowed to work for surrounding farmers. In most cases the boys return to the colony to sleep. The progress of each boy is care-

fully watched and if, necessary, he may be returned many times to the parent institution. This return is generally regarded as a disciplinary measure, although certain cases return voluntarily, preferring the life in the larger institution. The girls are placed in domestic or industrial colonies. If in the former, they are placed in private families as domestic servants, returning to the colony home at night. Their wages, in part, pay for the upkeep of the home and the self-support of the girls. The rest is placed to the girls' credit in the bank. Such care is exercised in the selection, supervision and placing of the girls that failures are comparatively infrequent.

These colony homes act as a half-way house to social rehabilitation. Added to this is a parole system for girls who may be able to adjust themselves to community life without even this degree of social guidance. This is, of course, a more doubtful experiment and does not meet with the same percentage of absolute success. There is not the slightest doubt that Dr. Bernstein's work constitutes a most courageous and successful experiment in the training and social rehabilitation of defectives.

The parole and colony placement is in charge of Miss Stebbins, who naturally must study her problems from every angle. Most important for the success of the work is her intimate knowledge of the characteristics of the girls she works with.

It is evident that at Rome there was the opportunity to try the social ratings scale and compare it with the actually observed success of the girls either on parole or in the colony. The writer, with the courteous permission of Dr. Bernstein, took advantage of a visit to Rome to obtain ratings from Miss Stebbins on a group of thirty girls who

had been tried on parole. Two other groups of colony girls, sixty in number, were also rated by three matrons of the colonies in which the girls were placed.

For the paroled cases Miss Stebbins chose, as far as possible, a fairly representative group. It included girls whom Miss Stebbins divided into five classes, according to their success in social adjustment—very satisfactory, satisfactory, medium, inferior and very inferior success. This five-point rating of observed success on parole was the measure of social sufficiency with which the indices were correlated. Miss Stebbins then gave ratings according to the social ratings scale.

The correlation of the weighted indices with social fitness was +.76. If the cases who were deemed by Dr. Bernstein to be psychopathic were eliminated, the correlation coefficient was .86. This is admittedly an extremely high correlation and, allowing for chance errors in observation, is somewhat remarkable. It provides fairly conclusive evidence for the validity of the scale, both as regards the selection of traits and their weighting. The correlation of Binet test age (Stanford Revision) with social fitness was only .32. The comparative value of mental age as a guide in the selection of defectives for parole may be gauged from these figures.

As before mentioned, the objection may be raised that as it is the same person who gives the ratings in the social scale and also observes the social success of the individual, judgment in the one direction may be largely influenced by knowledge in the other. In other words the girl who has failed on parole will tend to be rated poorly in the social rating scale. This objection would have more force if the traits under which the ratings were given were less numerous

or if the weightings were less varied. As a matter of fact, the inter-correlations of the ratings under the different traits were not extremely high. However, the best test was that previously used—viz., cross-correlation. Ratings were then given on another group of thirty girls by the matron of the colony in which they resided. These cases had not been paroled and their mental ages ranged from 5 years 10 months (Stanford-Binet) to 12 years, with an average Binet age of 8.86 years. Hence, they were, in average mental age, distinctly lower than the paroled group, whose average was 10.54 years, but who had a similar range in mental age from 5 years, 8 months to 12 years. Miss Stebbins' judgments as to the success of these individuals in colony adjustment were then correlated with the social rating indices as given by the matron. The coefficient was .78. Compared with this, the Binet correlated only .45 with colony adjustment. This latter coefficient is, however, higher than that obtained for the paroled group, whose Binet age correlated .32 with success on parole. This confirms results previously obtained by the writer, which showed that the nearer the mental age approaches the border line levels of social adjustment the less significant it is. Temperament and disposition, industrial skill and personal morality are apparently of far more importance than the level of general intelligence. In other words, the girl of nine to ten years' mentality with a temperament that enables her to stay "put" has a far better chance of successful adjustment than the girl with eleven to twelve mental age and a flighty disposition. Domestic service and lower forms of industrial work in factories—because of the narrow interests of these activities—demand temperamental stability rather than intelligence. Hence, in selecting cases for parole, it is important

to use methods of judging the girl's habitual reactions. It may be necessary to emphasize the fact that in the general problem of the adjustment of cases who are on the border line of social sufficiency, a far greater training and experience in individual psychology than merely practice in the application and scoring of mental tests is necessary. The writer's experience is that no special school or institution for defectives could run properly on a close classification of its cases by mental age levels. In every grouping of children for the practical purposes of education or industrial training, there must be a considerable over-lapping of mental ages. For instance, on the farm at the Training School at Vineland the lowest mental age amongst the boys at continuous work is five years per Binet and the highest is thirteen years, but the five-year-old boy is far from being the worst worker and the thirteen-year-old case is not the best. As regards social adaptation, the case is similar. Amongst Dr. Bernstein's colony cases the Stanford-Binet ages of those given the first-class rating, which means very satisfactory adjustment, range from 7 years 6 months to 11 years 2 months, the average being 9 years 6 months with an average deviation of 1 year 3 months. If we compare cases at the other extreme of social adaptation—that is, the very inferior group—we find a range in Binet age from 5 years 10 months to 9 years 10 months, the average being 7 years 9 months with an average deviation of 1 year 8 months. From these figures it is evident that there is considerable over-lapping in mental age, even between the very inferior and the very satisfactory group. As regards the paroled cases, the over-lapping was even more pronounced. The group with the most satisfactory social records ranged in Stanford-Binet age from 10 years 1 month to 12 years, whilst the least

successful group ranged from 9 years 3 months, also to 12 years.

Up to this stage we had been using Miss Stebbins' judgments. In order to obtain an idea of the reliability of the judgments of others of less experience, a third group of thirty girls were rated by two colony matrons. These girls were distributed between two closely adjoining colonies, so that one matron was able occasionally to relieve the other from duty. Because of this, the characteristics of the girls were fairly well known to both matrons. Both the social rating indices obtained from these two observers and their estimates of the girls' success in colony adjustment were pooled. The correlation between the pooled judgment of the colony adjustment of the girls with the pooled social estimates was .85.

Summing up the foregoing results, we may say that investigation with this group of ninety girls shows that the indices obtained by means of the social rating scale correlate very closely indeed with the degree of success attained in holding a place in community life either with a minimum of social guidance as in parole, or a greater amount of supervision as in colony life. So high are the obtained coefficients in comparison with the correlations between Binet age and social adjustment that it is evident that the social rating scale takes cognizance of most important aspects of personality which lie altogether outside the field of intelligence tests. Hence, whether for the purpose of classification in institution or colony life or for parole purposes, the social rating scale has essential advantages compared with mental age levels.

A further demonstration of its reliability can be made by comparing the individual indices with parole success on

a percentage of agreement basis. It has been stated previously that a tentative grouping would classify all cases with indices below 22 as being socially self-sufficient. Three of Dr. Bernstein's cases who obtained indices below this level all obtained a first-class rating as regards community success. Cases with indices of 28 or below were tentatively classified as social border line cases, having a reasonable chance of social success but requiring some social guidance. Of the 10 cases whose success in the world was stated as very satisfactory, 9 or 90 per cent. had social ratings of 28 or under. Of the 16 cases who gained indices of 36 or less, or in other words, a medium social rating, only one, or 6¼ per cent., attained worse than medium success on parole. Of the 6 cases who obtained a worse social rating than 44, none had a better than inferior or very inferior success on parole. From these figures it is evident that predictions of social sufficiency founded on social ratings would have had a very high degree of reliability.

Besides the reliability of its indices, the social rating scale possesses the great advantage of ease of application. All that is necessary for the special class teacher, parole or institution officer to do is to rate a group of individuals on a three-point basis according to their degree of possession of the seven anti-social traits of the scale. These ratings are then multiplied by the prescribed weightings and the result added to obtain the social inefficiency index. Wherever defectives are grouped together under observation for any length of time, social rating indices should be assigned to each of them. This should provide a very valuable guide to their future disposition, whether in the institution or the community. Systematized observation in this way will also give each teacher or social worker a more scientific method

in child study, so that the result both to the child and the student will be a happy one. Experience with ratings given by summer school students show that a comparatively limited time spent in observation of institution cases is sufficient to enable one to give fairly correct ratings. Pooled estimates of a number of observers with little experience of cases approach very closely to the ratings given by an expert observer.

RELATION OF SCALE TO MENTAL TESTS

Criticism of mental tests, and particularly of the Binet, has often been severe, but never searching. There has not been any thorough-going comparison of test results with experience founded on long and expert observation of cases. It is true that as regards educational capacity, teachers' estimates of children's progress and the school standing of pupils have both shown a fairly high correlation with Binet tests. There is, however, by no means a perfect correlation between mental age and school success. Cases in which mental age is of very little value as an indication of educational trainability are sufficiently numerous as to make any proposal to make mental age the basis of school grading of doubtful value. Temperament, special abilities and disabilities, varying school opportunities, dominant interests, psychopathic or delinquent tendencies are factors in the personality or history of individuals which affect their school progress. A strict school grading of children by mental ages would probably merely substitute one set of problems in school maladjustment for another.

It must be admitted that as regards the question of the relation of mental tests to the industrial capacity of defect-

ives there has been considerable work done. But it has been mainly on the basis of insufficient statistical treatment and with little regard to the negative instances. After all, it is ridiculous to think that the mere statement of mental age gives us any very useful information about the special industrial aptitudes and interests of a defective. Whilst certain rather wide limits in mental age may be useful as guides for the selection of cases for various industries, there will be a great deal of over-lapping of mental ages for each industry. As far as the writer's knowledge goes, there have been no studies which would give us satisfactory information as to the value of a year of mental age in relation to success in industrial occupations. No one, for instance, seems able to tell us what percentage of cases with ten year mental ages are better industrial workers than those with nine year mentalities. An investigation in any institution will show a very wide range in the mental ages of those concerned in any occupation. It is plain that other considerations beside mental age are of weight in determining vocational fitness.

But fitness for life in the community is determined by factors in addition to those involved in industrial adjustment. Social adaptability takes into account the ability for self-management as well as self-support. Hence the problem of social adjustment is an even wider one than industrial self-support. Consequently, a Binet test age is even more inadequate as an index of social adaptability.

The difficulty in the interpretation of mental test verdicts lies in the fact that, although a thorough-going comparison with experience is so desirable, it is extremely difficult to obtain. The psychologist who sees his cases merely for examination and report in the mental clinic has

few opportunities for discovering what actual reliance he may put upon the verdicts of various tests. In some cases he may have to wait ten years to find out whether his social prognosis is justified. The science of mental testing is seriously hampered because the testing usually ends in diagnosis and does not include treatment. The psychologist does not hold his cases under observation long enough to see how far the mental test verdicts are justified by experience. It is as if one attempted to make a microscopic study of organisms that were no sooner in focus than they swam out of the field of vision. No matter how well standardized scales for mental diagnosis are, the crucial test of their value is whether they really measure what they purport to measure. A yard-stick, no matter how carefully calibrated into thirds, twelfths and thirty-sixths, will be of value in measuring only if it actually does measure a yard. So, too, the question of the standardization of a diagnostic test is secondary in importance to the question as to whether it tests capacities of social significance. If it does not, then it is not worth standardizing.

The only thing to correct a scale or measurement by is another measurement. The mental tests, in as far as they are diagnostic tests, are used as short cuts to observation of the case. From the test reaction we try to predict the every-day conduct of the child. If this every-day conduct can be assessed or indicated in terms of a numerical scale then we have provided a means of holding the tests up to the mirror of experience. We can thus discover to what extent they are what they purport to be. The social rating scale gives by its indices a numerical expression of the individual's social adaptability and its indices are obtained not by any indirect method of mental examination, but by

direct observation of the child's every-day conduct. Just as mental examinations have been said to give cross-sections of intelligence, so we may say that a social rating scale should give us both a cross and longitudinal section of the personality. It should, therefore, be decidedly interesting to work out the correlations between mental tests and the social rating scale. We may then discover if our cross-section has been taken at the right level so that everything of social importance in the individual make-up is properly represented by the mental age verdict. Such correlations should be most helpful in helping us to put the right diagnostic interpretation on test results.

TABLE 25

MENTAL TESTS AND SOCIAL ADAPTABILITY

Males, 38 Cases	
Binet with Social ratings	r = .60
Porteus with Social Rating	r = .60
Binet-Porteus Average with Social Ratings	r = .73
Form Board with Social Ratings	r = .59
Females, 44 Cases	
Binet with Social Ratings	r = .69
Porteus with Social Ratings	r = .75
Binet-Porteus Average with Social Ratings	r = .79
Form Board with Social Ratings	r = .68

Accordingly, after we had devised a social rating scale and the proofs of its validity had been completed, two groups of cases were selected for correlation of their social rating indices with mental tests. The cases were limited to individuals of between 15 and 30 years of age and above 6 years (per Binet) mentally. These cases had been at

least five years under training in the institution. The number of males was 38 and of females 44. The coefficients are given in Table 25.

The conclusion indicated by this table is that the Binet and Porteus maze test appear to be equally good as regards their relation to social adaptability in boys. The average of the test ages, however, gives a much more reliable indication. With girls the Porteus test gives the more reliable diagnostic verdict, but the average Binet-Porteus age is again the best measure.

It should perhaps be pointed out that there are decided differences between the ratings as given in this study and teachers' ratings. Davenport[1], in referring to the foregoing study, refers to our indices as being founded on teachers' ratings. We believe that there are essential differences between judgments given by class teachers who see their pupils for a few hours a day for about three-fourths of a year and those given in an institution by one who has had the most intimate knowledge of the cases for periods of five to fifteen years and who has directed not only their school training, but has determined their cottage placement, their industrial occupations, their entertainment, and who has observed their conduct through all this time. We venture the assertion that it would be most unlikely that one would find a correlation nearly as high as .85 between two teachers' judgments of the same group of children when independently given, yet this coefficient was obtained between the two observers whose ratings formed the basis of the scale.

The form-board, it will be seen, correlated almost as well as either the Binet or Porteus test for this group.

[1] "Comparative Social Traits of Various Races." By Charles P. Davenport. School and Society. Oct. 1921.

When, however, the cases were limited to individuals above eight years Binet age, it was found that the Porteus test correlation remained about the same, the Binet coefficient was slightly reduced and the form-board coefficients were decidedly less. This shows that the significance of the form-board test diminishes with increased mental age. These results have been reported in the publication previously mentioned.[1]

Realizing the importance of the work of comparing mental tests with the verdicts of experience in this way we determined to test our previous findings with another group of cases. Miss Marjorie Babcock, research assistant at the laboratory, with the writer's collaboration, undertook these further investigations. Ratings on a group of thirty boys were obtained from the same judges as before and the social indices were then correlated with the Binet and Porteus ages. The cases consisted, in the main, of industrial workers in the various occupations in the institution and were limited to males between 14 and 30 years of age. The older cases were excluded because their very long residence in the institution resulted in an adjustment as a result of which certain anti-social traits that had at one time characterized their behavior tended to disappear. Long years of institution control and discipline have had a stabilizing effect so that, as a general rule, we find that the older institution cases obtained a high social rating chiefly because of the industrial capacity which they had developed through routine training, and because they had formed habits making for temperamental stability.

The differences between the Binet and Porteus correlations with the social rating indices were striking. With Mrs.

[1] "A Study of Personality of Defectives with a Social Rating Scale."

Nash's rating the Porteus tests correlated .70; the Binet only .32. With Mr. Arnade's ratings the Porteus test correlated .56; the Binet only .21. It was evident that for this group at least the Porteus test gave much more reliable estimates of social adaptation. Social ratings and general social estimates were also correlated as before: Mr. Arnade's ratings correlated .83; Mrs. Nash's, .89. The two judges' ratings inter-correlated .78. These cases being industrial workers were probably somewhat better known to Mrs. Nash.

In considering these results it was realized that, although the group was small, it contained a disproportionate number of young men between 18 and 25 years of age who were high-grade cases, good industrial workers and who were passing through a somewhat unstable period in adolescence. Temperamental factors would be more likely to affect both their Porteus tests and their social ratings. Miss Babcock accordingly decided to continue comparisons with four groups of other chronological limits. Low-grade cases were excluded, as it was obvious that neither mental tests nor social ratings had much significance in their case.

The first chronological age group consisted of school boys from 10 to 14 years of age. These children had been, comparatively speaking, a short time under training, and it was evident that the ratings such as those given to planning capacity must be based largely on the school progress and conduct. In other words, the social rating index represented a prediction of social adaptability rather than a well-founded estimate. Accordingly, the expectation was that, as intellectual development and general intelligence would naturally influence these predictions, a high correlation with mental tests would be found. This expectation was ful-

filled, the social rating indices correlating .82 with Binet age, .81 with Porteus age. Usually the Binet correlates much higher than the Porteus with ordinary school attainments, but in this case it must not be forgotten that planning capacity, the most important trait in the scale, would be judged not so much on ordinary school work but in manual training courses.

As regards the size of these correlations, it might be observed that the boys were at an age when the ability for self-management was not so much in question as it would be at a later period. At this age intelligence would undoubtedly enter largely into social adjustment. Psychopathic tendencies, except in occasional or gross cases, would as not yet be much in evidence. Such as had already appeared would be very likely to be looked on as unimportant and merely incidental to the ordinary development of the boy.

The next group consisted of boys from 15 to 20 years of age, and contained some who were at school part time and others who were scheduled to institution industries. These might be said to be passing through a transition period of difficult adjustment. More changes are made in industrial schedules of boys at this age than at any other. Temperamental instability shows itself in the desire for quick changes in employment, in the development of animosities towards instructors or fellow workers. The strongly dominating interests in industrial directions have not yet developed. All these factors have a disturbing effect. At this period, because it is a transition one, social ratings are possibly somewhat uncertain and the value and reliability of tests of intelligence are also decidedly less. For the group, the Binet and Social Ratings correlated .62; Porteus, .64. The number of cases was 32.

The third group of 33 cases consisted of young men from 20 to 30 years and contained a majority of high-grade cases who are amongst the industrial mainstays of the institution. For these the earlier period of instability had largely passed. They had become, in the main, well adjusted, had developed interest in their work and are more or less contented and stable. Practical intelligence and temperamental stability are here at a premium, whilst memory and linguistic ability have little relation to social adjustment. These considerations may help to account for the comparative superiority of the Porteus test for this group. The Binet correlated .46 with social rating; the Porteus, .72. It was with a similarly constituted group that the same disparity in the coefficients had been previously observed. The fact that the repeated experiment confirmed the previous results gave added significance to the differences in the coefficients.

In another section it will be shown that in the adult mazes used by Miss Bassett improvement was shown up to the age of 20 years. Provided that these adult tests examine the same capacities as the lower tests we can regard the maze tests somewhat in the light of tests of maturity. Hence these cases may possibly have obtained relatively better Porteus records because of their age.

In the fourth group tested by Miss Babcock, however, the case stood differently. These consisted of individuals whose chronological ages ranged from 30 years upward. These were not as high, on the average, either industrially, socially or mentally, as the 20 to 30-year group, although there were some well-trained dependable workers amongst them. These differences between the groups are reflected in the mental ages. The average Porteus age of the younger group was 8.4 years, Binet 8.1 years. In the over-thirty

group the ages are lower and the relative positions of the tests reversed. The Binet average was 7.45 years, Porteus 7 years. A certain elimination through parole and dismissal of the more intelligent well-trained cases takes place before this age. In addition, temperamental differences have tended to diminish in influence so that as regards social adjustment the intellectual factor carried more weight. As a consequence the Binet has a higher correlation, being .85, as against .78 for the Porteus. The relation of these correlations to the average ages of the groups goes to prove that the Binet's significance as regards social adaptability is less the nearer we approach to critical or border-line levels. In the lowest age group, where the high correlations with the Binet were found, the average Porteus age was 7 years, Binet 6.5 years. The second group showed the greatest variation in average age between the two tests, viz., Porteus 9.7 years, Binet 7.7 years. The evidence of instability marking a transition period is forthcoming through an examination of the cases of this group. Delinquent tendencies causing disciplinary problems were very characteristic of its members. After a settling-down period in the institution it would seem reasonable to expect a closer relation between the mental ages and the social adaptability of this group.

The correlations, average mental ages, etc., are summarized in Table 26.

Realizing that the numbers in the above group are small with consequently large probable errors we decided to use a larger group, excluding all cases below 14 years, as it appeared that the value of our results below that age was somewhat doubtful. Accordingly, Miss Babcock obtained social ratings on a group of a hundred males and correlated their indices with Stanford-Binet age, Goddard-

TABLE 26

CORRELATIONS OF SOCIAL RATINGS AND MENTAL TESTS

Age Group	No. of Cases	Average Binet Age	Average Porteus Age	Binet-Social Correlation	Porteus-Social Correlation
10-14 yrs.	42	6.5	7	.82	.81
15-20 yrs.	32	7.7	9.7	.62	.64
21-30 yrs.	33	8.1	8.4	.46	.72
30 yrs. and over	30	7.45	7	.85	.78
10-20 yrs.	74			.69	.61
21 and over	63			.68	.74

Binet age, with Porteus age, with the Goddard-Porteus and Stanford-Porteus averages. The coefficients are given in Table 27.

TABLE 27

CORRELATIONS OF MENTAL AGES AND SOCIAL RATINGS—100 CASES

Social Rating with Goddard Age	r = .62
Social Rating with Porteus Age	r = .67
Social Rating with Stanford Age	r = .60
Social Rating with Goddard-Porteus Aver	r = .77
Social Rating with Stanford-Porteus Aver	r = .73
Porteus Age with Stanford Age	r = .56
Stanford Age with Goddard Age	r = .92

This table presents some very significant facts. It should be noted that the Porteus tests have a slightly higher correlation with the social ratings than either revision of the Binet. As regards the Goddard and the Stanford, the advantage, if any, is with the Goddard. This may be due, in part, to the fact that most of the ages of the cases fell within the limits where the Goddard age is the most reliable. It is significant also that when the mental ages by either the Goddard or the Stanford are combined with the Porteus age, the correlation with social adaptability is decidedly higher. The correlation between the Stanford and Porteus is comparatively low, viz., .56. This is an additional reason why they should be combined as a test "battery." If correlation between the two tests is very high, it would be obviously unnecessary to combine them, as it would be equivalent to plowing over the same ground twice. This has not been realized, apparently, by some investigators who have been

inclined to discount the value of tests unless they show a high correlation with the Binet. The plan of making the Binet the touchstone of reliability and validity for all other tests is unwarranted in practice, unless, of course, the idea is to obtain an alternative or substitute test for the Binet where the latter is inapplicable. This was the case in the selection of tests for individual examinations in the U. S. army tests, where the high correlation with the Binet determined very largely the choice of tests. It is not surprising that the individual examination scale was early abandoned in favor of the Stanford-Binet and Point Scale. This individual examination scale was intended to supplement the group examination by the testing of the men ranking lowest on the group scale.[1] Many investigations have shown a very high correlation of both army Alpha and Beta with Binet, showing that they tested substantially the same group of mental capacities. Hence, we venture to suggest that a better supplementary examination, bringing more significant results would have been obtained if a test or tests not correlating so well with the Alpha had been chosen for individual examinations. The Stanford and Point Scale were evidently selected, not on the basis of any proven superiority as diagnostic measures, but merely on account of their greater familiarity to examiners. Mental age, presumably per Binet, was the standard and "test scores which could not be readily translated into terms of this concept were unsatisfactory."

As regards any comparisons between verbal and non-verbal tests of intelligence, it should be remembered that their reliability varies with the levels of intelligence and the object for which they are applied. In a recent article by

[1] "Psychological Examining in the United States Army." P. 306.

John P. Herring[1] he reaches the conclusion that "it seems to be the more purely abstract and the more purely verbal tests that afford the closer measures of intelligence." In another place he remarks that "it is hod carriers who typically deal with concrete situations." It should not be forgotten that in mental diagnosis it is precisely with the levels of intelligence of hod carriers and their like that we are concerned—hence the superiority for diagnosis of the concrete test. It is not with the manipulation or development of ideas that we are so much concerned in the diagnosis of defectives; still less is it with their learning capacity as evinced by school attainments and progress; what is of importance is their ability in concrete tasks, their ability to attain self-support and self-management. The observations of the above-mentioned writer may hold good as regards social success, but not as regards social inefficiency.

RELIABILITY OF MENTAL TESTS

On account of the fairly complete records available for the last-mentioned group of 100 cases it was thought advisable to examine the relation of mental tests to social ratings not only by the correlation method but by consideration of case histories of individuals exhibiting wide differences in their rank orders by the two measures. It is also important to know not only the extent of the deviation but also the percentage of cases in which disagreements between the tests and the ratings occur. We required some criterion, however, by which we might determine what should be regarded as a serious disagreement between the test ages and the social ratings. As there were 100 cases we decided

[1] "Verbal and Abstract Elements in Intelligence Examinations." By John P. Herring. Journal of Educational Psychology, Dec. 1921.

to examine the rank orders of the individuals in both the mental and the social measure. If these rank orders differed by more than 30 places we would then consider these cases of serious disagreement. By the use of the terms "over-estimated" and "under-estimated" we could then indicate whether the rank order of the individual in tests was more or less than his rank order in the social measure.

The number of cases over-estimated by the Binet in relation to their social rating was 13. On the other hand, 14 boys were under-estimated, or, in other words, possessed a greater social adaptability as measured by the rating scale than their intelligence level appeared to warrant. Twenty-seven per cent. therefore of the whole group were cases in which marked deviations between Binet ages and social ratings appeared. The number of cases over-estimated by the Porteus was 9, the number under-estimated 11, giving a total of twenty cases of extreme disagreement. We may state this differently by saying that the Porteus test scores agree reasonably well with long continued observation in about 80% of the cases, the Stanford-Binet in 73%. We do not mean that in these cases the tests are necessarily wrong as the social ratings are by no means infallible. We can say, however, that these percentages represent the number of cases in which the tests agree with the best measure of experience available. Allowing for errors of observation this may be considered a close agreement. However, it should not be forgotten that a difference of rank order of 30 places in a group of 100 cases is not a very severe test of agreement.

If the Stanford-Binet and Porteus ages are combined the number of cases in disagreement is reduced to eighteen, ten being over-estimated and eight under-estimated. Not only is the number reduced but the extent of the deviation tends to be diminished also.

TABLE 28

EXTREME DIFFERENCES IN SOCIAL RATING AND MENTAL TESTS

Over-estimated by Binet

Case No.	Social Rating	Rank Order	Stanford Binet	R. O.	Porteus	R. O.	Binet Porteus Average	R. O.	Binet Diagnostic
29	35	58	11^{2}	9	9½	32½	10^{4}	14	9
53	36	68	9^{8}	17	7½	68½	8^{7}	43½	8
37	36	68	8^{3}	38	12½	6½	10^{5}	13	11
78	39	77	8	43½	7½	68½	7^{9}	63	7
81	38	74½	8^{8}	30	8	62	8^{4}	52½	8
87	39	77	8^{8}	30	7½	68½	8^{1}	58	10
76	41	81½	8^{4}	35½	8½	55½	8^{5}	48	10
74	42	85	8^{9}	28	9	42½	8^{11}	39	8
75	42	85	9^{8}	17	7½	68½	8^{7}	43½	9
80	41	81½	9^{8}	17	9	42½	9^{4}	28	8
90	46	90½	9	27	5	87	7	74½	9
91	52	97	7^{2}	62½	5	87	6^{1}	83	7
92	50	93½	7^{3}	59	8½	55½	7^{11}	60½	7

We should also take account of where the cases that are apparently misjudged stand in the social rating scale. It was previously mentioned that according to the grouping we have adopted all cases below 28 in social rating are considered to have a chance of success in the community or in other words are near the borderline of social efficiency. Of the cases under-estimated by the Binet six have social ratings below this figure. Of those under-estimated by the Porteus three have social indices below 28. These cases are reduced to two when their Binet-Porteus average rank order is con-

sidered. It is evident that under-estimation is much more serious when it applies to children above the border-line of social efficiency. A low rating by intelligence tests might result in the institution segregation of an individual who would really be self-managing and self-supporting outside.

TABLE 29

EXTREME DIFFERENCES IN SOCIAL RATING AND MENTAL TESTS

Under-estimated by Binet

Case No.	Social Rating	Rank Order	Stanford Binet	R. O.	Porteus	R. O.	Binet Porteus Average	R. O.	Binet Diagnostic
2	22	11	7	68½	10	26½	8^{6}	45	9
3	18	4	8^{3}	38	9	42½	8^{8}	41½	11
6	21	7½	7^{7}	53	10½	21	9^{1}	34	7
8	22	11	7^{2}	62½	11	16	9^{1}	34	7
11	21	7½	8^{2}	41	11	16	9^{7}	23	9
18	15	17	7^{8}	50	11	16	9^{4}	28	10
66	28	22½	7^{4}	56½	9	42½	8^{2}	55½	7
59	29	26½	5^{4}	87½	5½	83	5^{5}	89	6
70	33	43	6^{10}	73	12	10	9^{5}	25½	6
64	30	30	6^{10}	73	10	26½	8^{5}	48	7
34	34	49	6^{4}	80	8	62	7^{2}	72	6
60	35	58	5	91½	6½	29½	5^{9}	84	6
41	29	26½	7	68½	7	75	7	74½	6
43	33	43	6^{4}	80	5	87	5^{8}	85½	8

TABLE 30

EXTREME DIFFERENCES IN SOCIAL RATING AND MENTAL TESTS

Over-estimated by Porteus

Case No.	Social Rating	Rank Order	Stanford Binet	R. O.	Porteus	R. O.	Binet Porteus Average	R. O.	Binet Diagnostic
36	33	43	8^{6}	33½	12½	6½	10^{6}	12	12½
70	See	Table	21						12
51	35	58	7	68½	10½	21	8^{9}	40	10
37	See	Table	20						10½
77	38	74½	7^{4}	56½	9½	32½	8^{5}	48	8½
73	40	79	6^{2}	84½	12	10	9^{1}	34	10
81	41	81½	9^{8}	17	9	42½	9^{4}	28	9
74	42	85	8^{9}	28	9	42½	8^{11}	39	7
92	See	Table	20						8½

Under-estimated by Porteus

Case No.	Social Rating	Rank Order	Stanford Binet	R. O.	Porteus	R. O.	Binet Porteus Average	R. O.	Binet Diagnostic
12	4	1	11^{9}	5	8½	55½	10^{2}	15½	8½
3	See	Table	21						12
16	25	17	11^{3}	8	7½	68½	9^{5}	25½	7½
42	28	22½	10^{3}	15	8	62	9^{2}	30½	8
41	See	Table	21						7
59	See	Table	21						7½
45	31	34½	7^{4}	56½	5	87	5^{8}	85½	5
39	33	43	7	68½	6	81½	6^{6}	81	6
43	See	Table	21						5
26	35	58	6^{6}	76½	4	96	5^{3}	90	4
31	28	22½	9^{7}	19	8½	55½	9^{1}	34	8½

Of the thirteen cases over-estimated per Stanford-Binet three belong in the well-adjusted group, eight in the psychopathic and two in the delinquent class. It is very evident by these results that the Binet tends to over-estimate the psychopathic or, as we have before stated, psychopathy is independent of mental age. Of those under-estimated per Binet six are well-adjusted, seven are delinquent and one psychopathic. It would appear that the Binet somewhat under-estimates the delinquent group.

Of the nine cases over-estimated by the Porteus test three are well-adjusted, three delinquent and three psychopathic. Of those under-estimated six were well-adjusted, four delinquent and one psychopathic.

It is noteworthy that the six well-adjusted cases who scored relatively too low per Porteus were all cases who were chronologically over 30 and had been a very long time under training in the institution. They have become well-adjusted in the course of time. They have routine duties which they perform well, and it is possible that the social rating scale exaggerates their social adaptability. At least four of the cases over-estimated by the Binet belong also in the class of steady-going, well-trained cases of long institution residence. The examination data for the cases of extreme deviation are given in Tables 28, 29 and 30.

CHAPTER VI

CASE HISTORIES

The reasons for the disparity between the test verdicts and the social ratings can best be appreciated through a consideration of some of the case histories. We have therefore chosen cases in which the differences are most significant and have summarized reports showing the subjects' characteristics as they have been observed over a period of years.

No. 1. H. H. Age 27 Years.—This case according to his two social ratings independently given with a year's interval between is seriously under-estimated by both tests. His adaptability is such that he has social ratings of 29 and 31, which put him not far outside the border line of social competency. Yet his Binet is only 5.3 and his Porteus 5½ years. This case is, according to his social rating, seriously under-estimated apparently by both Binet and Porteus tests.

He was admitted to the institution at eleven years of age. In 1909 after four years of training it was recorded that he was doing good work in housework but very poor work in woodwork. He was described as being very quiet, obedient, very slow at any task but very willing and persevering. Four out of six persons reporting on this boy at this time stated their opinion that he was at a standstill in development. His inability to adapt himself readily to new tasks was cited but he was noted as being easily managed and "fond of animals."

Several years later he had progressed to the extent of being trusted to drive a wagon and is reported as being very slow but thorough in his work.

In 1914 his school reports state that he has never succeeded in doing anything worth noting in school work, although much effort had been bestowed on his training. This was true not only of his ordinary school work but of his manual work as well. Apparently his low mental level gave a very true indication of his school trainability. It was reported that in the coarser kinds of industrial work, such as gardening, he did fairly reliable work after he had come to understand thoroughly what was required of him. He was neat and careful with his clothes but lacked energy, interest and initiative. Would spend a long time doing nothing. He was very silent, very forgetful, very slow, generally obedient but not truthful.

In 1915 he had apparently kept on improving in efficiency in a slow but sure fashion. His evenness of disposition is noted in reports and his consequent ability to get along well with other boys. He is now reported as one of the best teamsters on the farm and that he "understands driving thoroughly and keeps at his work without following up."

At the present time he is still fulfilling a certain round of duties with faithfulness and efficiency. He drives a one-horse wagon which goes the round of the cottages collecting the refuse. In this work he has the direction of three other boys, one of whom is three years above him in mental age. His lack of adaptability to new situations is shown by the fact that if his itinerary is changed it takes him about a week to adjust himself. His worst fault is his forgetfulness. He was reported on several occasions as having been responsible for the breaking of harness through lack of care.

In the summer time he drives a one-horse lawn mower and does the work with efficiency and economy of effort. He understands the adjusting of the machine and works with practically no supervision. He also drives two horses with the spraying machine in the orchard.

As regards his capacity for self-management it is noteworthy that when he leaves the institution for a vacation, he is allowed to go unattended a journey of thirty miles by train and has even been trusted to take charge of another child going to the same city. His ticket would of course be bought for him, but he could be trusted to find his way about the city where he lives—a town of one hundred thousand population.

Adverse reports have been made regarding his moral habits. He is said to have sex propensities which necessitate close observation.

Summary—As far as the scale goes his rating may be accepted as a very fair estimate of his social adaptability. Whilst his progress has been largely the result of long continued routine training and his lack of adaptability has been frequently commented upon, it must be admitted that the tests have missed something in this boy's make-up, some traits or abilities which have influenced his good adjustment. Other cases with similar or even higher mental ages and with equally long training have made much poorer records in the institution. It is the story of the hare and the tortoise over again. The factors which have made for this boy's success are his perseverance, his evenness of disposition, which together make for slow but sure adaptation. Here is a case of practical intelligence not adequately assessed by either concrete or abstract tests. In the new form and assem-

bling test his slowness again handicaps him. He ranks 69 in a group of 85 and his score has a rating of about seven years by our tentative scoring. This rating, however, reflects his actual ability much more accurately than either the Binet or Porteus.

An analysis of his social ratings reflects very well the outstanding traits of his personality. His worst rating of 2½ is under "irresolute and easily confused," which indicates his inability to deal with a new situation. Here in all probability lies the cause of a comparative failure in the maze tests. He obtains ratings of 2 in lack of planning capacity, simpleness and suggestibility and moodiness. Ratings of 1 under impulsive, nervous and excitable, and silly and obtrusive reflect his phlegmatic nature and evenness of disposition. His last social rating was 31, which puts him into the dependable, easily trainable group.

An examination of his records shows that in the Binet test he could not count four pennies nor repeat four digits (year IV), did all the tests for year V, did not know right from left, could not count thirteen pennies nor repeat sentences (year VI). He knew the difference between a fly and butterfly, etc., but this was the only seven-year test he succeeded in except the alternative (tying the bow knot). He was very slow in his responses. It was evident that rote memory and number sense are very deficient in this boy. In the Porteus test he failed the five-year test as he did not seem to understand the directions. He succeeded in the six-year test on the second trial, passed the seven-year test on the second trial, failed in the eight-year test, passed the nine-year test on the first trial, but when it was inverted required two trials. His score was 9 years minus 3½ years, equals 5½ years.

Because he passed a test more than three years above his mental age he is credited by the diagnostic score with a two-year addition, bringing his age to 7½ years. Out of 470 cases he is one of two who earned this addition.

By the Porteus test inverted he scored eight years, requiring only one trial in the fifth, sixth, seventh and eighth-year tests and failing thereafter. The Porteus test records evidently reflect his somewhat slow but sure adaptive powers, although his test age is too low. Eight years of mental age would be about right for his comparative standing.

In the form-board he tested seven years and in the Knox cube five years. His brain capacity was equal only to the normal three percentile, head length and head height being markedly deficient. He was on the 41 percentile for the average of height, weight, and sitting height percentiles, the sitting height being most deficient. Right and left grip were much below average for his development and vital capacity markedly so. The picture as outlined is that of the sub-evoluted type, stable in temperament, slow and irresolute but persevering in reactions, deficient in immediate memory with poor learning ability, but with a marked capacity for slowly acquiring efficiency in the coarser kinds of industrial work. In relation to community value he is distinctly under-estimated by tests.

Case 2. Over-estimated by Tests

The next case history presents a picture of another kind. This is a boy with psychopathic tendencies and who is over-estimated by tests. His mental age per Binet was $8\frac{3}{12}$ and by Porteus 12½ years. His social rating was 36 with a rank order of 68. His Binet rank order was 38 and

Porteus 6½. Apparently both tests over-estimate his social adaptability—the latter grossly so.

The earliest reports on this boy go back to 1914 when he was examined by Dr. Doll. At this time he tested seven with a basal year of five—"a typical dementia scattering, but this is not confirmed by any other symptoms during the examination nor by the performance in other tests." Medical examinations showed very small thyroid and sexual glands. Form-board performance is noted as being very good. Re-examined a year later he had a basal year of seven and a test age of $8\frac{2}{12}$. His good memory was noted. Form-board performance was between eight and nine years record. The examiner noted his "rambling persistent chatter. His talk is of an exciting nature, such as killing police, cow boys, weapons, etc."

In March, 1916, his attendants and teachers all reported improvement though his cottage supervisor notes that he talks of killing the other boys when he quarrels with them. He is easily excitable, but is affectionate, cheerful and obedient. All without exception predict improvement under training, and Mrs. Nash notes that he has learned to do many new things and was making good progress in manual training.

In 1917 his conduct is improving, although he is still somewhat quarrelsome and lazy.

In 1920 reports speak of decreased nervousness but difficulty in managing him. He was scheduled as an errand boy and was getting rather dissatisfied and wished to work in the laundry. At this time the boy had a period of marked mal-adjustment. He quarreled with his supervisor and to be revenged broke open her desk and stole or hid a pocketbook and various other things. In his cottage life he had an excited period, during which he was reported as doing

very queer things. Amongst other things he caused some damage by going to the second floor of his cottage and turning on the water spigots in order to make a water-fall on the floor below, saying that he wished to imitate a moving picture scene. Became very restless, wandered away from the institution at night. Said that he tried to break into a house and that he would like to be a burglar. Said that he tried once to burn a school down but people came before he got it alight. After this disturbed period he seemed satisfied with the attention he created and then settled down into a period of stability. At present all the reports speak of him as being quiet and well behaved and doing very good work in laundry and house work.

His last Stanford-Binet examination given in 1919 credits him with a mental age of 8 years 3 months. His basal year was 7, but he scores successes as high as 12 years, where he gets credit for the ball and field test. He passes one ten-year test—the 60 word association test. In year IX he knows the date and repeats 4 digits backwards. In year VIII he fails in the vocabulary test, definitions and the similarity test. He is evidently of the non-verbal type with good mediate and immediate memory. He earns a Binet diagnostic score of 11 years, which is much in advance of his mental age. This score is earned by his successes in the ball and field (12 and 8 year credit) and also in the following—60 word association test, repetition of 4 digits backward, repetition of 5 digits and the divided rectangle test (V—5). Hence he has evidently very good native ability.

His Porteus test shows some marked peculiarities. He required two trials for the six year test and two each for the ten, eleven and twelve year tests. His score is fourteen years minus 1½ years equals 12½ years.

By the diagnostic score (Porteus) he incurs a three year penalty for second trials more than two years below his mental age (six and ten year tests), giving him a score of 9½ years. This would undoubtedly be nearer his mental level. The "scattering" in the Porteus test is very characteristic, it will be noted, of the psychopathic and delinquents of impulsive temperament.

His brain capacity is a little above normal, (53 percentile—Berry-Porteus tables). At 15 years of age his head height is above the normal adult figure, whilst his head length is 6m.m. below average. As a consequence his length-height cranial index is extremely high, being five points (or about twice S. D.), above the male average. His normal brain capacity associated with abnormal head form, disproportionate head height, and subnormal mental level is, as we have seen in a former section, typical of the psychopathic. Physically he is under developed with very poor strength and vital capacity—his physical excess being 18.

The picture is that of a psychopathic with recurrent periods of instability, but normally with good adaptability to industrial work provided it satisfies his interests. Allowed to proceed along these lines of interest he becomes fairly well adjusted. Any change in the course of his work or cottage life or any disagreeable happening seems to precipitate a disturbance in which his inherent lack of moral sense becomes easily apparent.

As regards his social ratings it is noteworthy that both Mrs. Nash and Mr. Arnade gave him the same index, viz., 36. The latter, however, gives him a worse rating in planning capacity, irresolution and suggestibility. Mrs. Nash rates him worse in impulsiveness. They agree in rating him 2 on moodiness and obstinacy.

It is probable that his social rating if anything is rather better than it should be. The disparity in the individual ratings illustrates the difficulty in rating a psychopathic case whose instability is periodic rather than permanent.

Case 3. Over-estimated by Binet and Social Rating. Under-estimated by Porteus Maze Test

W. S. is 22 years and was admitted to the institution in 1917. His admission examination was given by Dr. C. T. Jones. By the Goddard revision he scored 11 4-5 years but by the Stanford revision 17 years and 3 months, which is equivalent to better than average adult levels, and in comparison with the army results would be considered at superior adult levels. The examiner stated that although there was no striking evidence of a psychopathic condition, yet he had a very strong subjective impression that something was wrong with this boy. His personal history showed that he had been expelled from school because of a series of petty thefts and inability to adjust himself to his surroundings. The details of his Binet examination show that his first failure was in year XIV where he failed to give the difference between a president and a king. He succeeds in all the tests for year XVI (average adult) except the difference between abstract words. Gets the paper cutting test, the seven digits backwards and half credit for repeating the thoughts in difficult passages. These results were obtained when the case was 17 years 3 months old and he was credited 100 I. Q. Using 14 years as the average level, his I. Q. is 123.

His first Porteus test was given in 1917 when he required two trials in the 6 year test, two trials in the 10

year test and two trials in the 11 year test, failing in the higher tests. He scored 11 years minus 1½ years, equals 9½ years. A remarkable thing is that when this test was repeated two years later he still scored 9½ years. This is most unusual, as generally there is marked improvement at a second testing. He required on this second occasion two trials in the 8, 9 and 10 year tests and failed on the 12 and 13 year tests.

After admission he was scheduled to the poultry farm, where his supervisor reports him to be very bright but to need constant supervision and "lacking in pep for his age." He was quite talkative and had a great tendency to idle away his time. His cottage reports speak of his being very well behaved and industrious.

Several months later he is recorded as being very dirty as regards his person, although liking clean clothes.

A most interesting comment is the following from the farm: "He is doing very nicely. His work is assistant to C. H. He is inclined to do everything C. H. is doing, handling horse and wagon, helping to haul in green forage for cows. It is our idea to have him learn as much of C. H.'s work as possible, so as to have him take his place in case of a pinch."

The interest lies in the fact that the boy whose assistant he was being trained to be had a mental age of seven years four months—a 17 year old mentality assistant to a 7 year old!

Again in 1917 he was reported on by Dr. Jones, who seemed puzzled by his apparent willingness to remain at the institution. There was no evidence at this time of his former habit of pilfering. He had showed improvement in many respects. He was reported as being rather suggest-

ible and easily influenced by those about him. In November of the same year his attendant reported that she thought he showed no pride at all in his personal appearance. He seemed perfectly contented with the situation here and said he was quite willing to stay until his parents decided he should leave.

In 1920 the cottage attendant reported that "there isn't much to say about him. He isn't clean in his person and would never change his clothing unless told to. Sex habits are bad. Never talks of home any more and seems perfectly contented. Interested in farm work and enjoys it."

In 1921 he is reported as having "a queer disposition," as evidenced by his taking a notion to keep by himself for a time or to single out one boy and ignore the rest. He is very easily offended and so must be managed tactfully. On the farm he "does a little of everything but needs supervision."

At the present time he is still at the institution and presents its most interesting problem. He shows not the slightest ambition nor desire to get out. If questioned, he says he is glad to stay to learn farming so that he can some day run a farm of his own. This is precisely what he said four years ago. If it were not that his high mental age were known, this boy would pass muster with the rest of the high grade defectives. He consorts with boys of 11 to 12 years mentality and no one would suspect him to be above their level. He appears quite satisfied with the life that a feeble-minded institution offers and is utterly apathetic to his condition.

His social rating scale somewhat misses his specific volitional weakness and his suggestibility. Compared with the genuinely feeble-minded he naturally earns a good

rating. Compared with normal boys of his own age his lack of planning capacity, his suggestibility, irresolution and moodiness would stand out in relief. There is evidently an inadequacy of personality which is indicated chiefly by an inability or unwillingness to strike out for himself. This condition of voluntary dependence we have been forced to class among the psychopathic tendencies despite the fact that there are no very definite psychopathic trends apparent. The contrast between his Binet and Porteus age is certainly remarkable. Neither test is right. He is not in a 17 year class nor yet is he as low as 9½ years. An average of the Binet and Porteus age gives a very true indication of his intelligence level. His brain capacity equals the 27 percentile. Although this is somewhat below the average he still has many of the physical characteristics which are found to be typical of the psychopathic. Despite the fact that his brain capacity is much below average his head height is above that of the normal adult. His head breadth is 8m.m. below the average which is about 1.7 times the normal S. D. His breadth height index on account of these unusual measurements is 94 which is over 5 points above the normal index.

His physical measurements equal the 75 percentile (physical average) whilst his psycho-physical average is only 20—a physical excess of 55 points. This great variation, too, is typical of the psychopathic. His future history will be observed with great interest.

Case 4. Under-estimated by Porteus Test

This case is now 26 years of age and tests 11 years 3 months by Stanford-Binet, with a basal year at 8. His response to the ball and field test is, however, of very prob-

lematical value, as he simply drew a design like a button hook and his record blank gives as his comment "I wouldn't walk all over the field." It is quite evident that he did not understand the problem as it was stated. This would reduce his mental age and would give him a basal year of 7. In year IX he failed to arrange the weights correctly and also to repeat four digits backwards. He passed all of the ten year tests and five tests for year XII, failing in the ball and field, in repeating five digits backwards and similarities. He is evidently of a type with good language facility as is shown by his vocabulary and comprehension tests. He has a good memory for sentences and ideas, but it fails him when the task is one of substitution and rote memory such as in the repeating digits backwards test.

His first record with the Porteus test dates back to 1917, when he scored 7. Retested in 1919 he required two trials in the six year test, two in the seven, passed the eight year test, failed in the nine year, passed the ten on the second trial but failed when it was inverted. His score was again 7 years. By the inverted series he scored only six. It was quite evident that his non-success was by no means accidental and that he shows a real lack of adaptation to a task of such a nature.

However, his institution history contradicts this record, and the social rating scale reflects very well this history when it accords him an index of 25 (given by Mrs. Nash). Mr. Arnade's rating for this boy was 32, so that an average would be 29, which would put him just outside the borderline of social sufficiency. His Binet record is somewhat too high but a Porteus age of 7 years is decidedly too low. It is quite evident that in such a case the Porteus test exaggerates certain defects in intelligence.

This case has added interest because it was one selected for sterilization. This was carried out in 1912 when the boy was 17 years of age. This may have had a stabilizing effect on his temperament, but there is very little evidence of decided change in behavior. According to reports he was always quiet, rather solitary, immersed in books, indolent, slow but sure, cheerful and contented. There are only two records against him for attempted escape from the institution. After the operation for sterilization reports seem, if anything, to improve.

In 1912, two years after admission, we find reports as to his improvement. He was doing fair work in the laundry and his disposition was said to have improved. He was quiet, obedient and willing, silent, bashful, slow, good tempered and sensitive.

In 1914 he was reported as being sluggish in farm work, of a moody disposition, sometimes contented and other times the reverse. In 1915 he was reported as being neat and clean, taking good care of himself. Temper usually even, but at times quick tempered and stubborn. It was at this time that, under the influence of another boy, he made plans to run away. He is apparently very suggestible. On the farm he did not receive a good report. He is noted as being at times "perfectly stupid" and unable to keep his mind on his work. He was said to need close supervision. Our latest reports show some changes in disposition and behavior. He does very poor work in gymnastics and is noted as being slow to learn. He is not in good health. On the poultry farm his work was "not very dependable." A cottage report reads "partly insane. Gets along all right for a while then gets sullen and uncontrollable. Has fits of temper. Works very well when he is good. Is punished by

being sent to his cottage when he has those spells. Valuable boy in the clothes room. Very moody." Another report from the poultry farm states that he is a "good boy but very slow to comprehend."

Notwithstanding this change in his reports this boy's work in the institution is of a responsible nature. His social rating may be accepted as a fair picture of his present condition. He may possibly develop psychopathic tendencies but there are no marked indications excepting perhaps his moodiness.

His brain capacity equals the normal 32 percentile. He is under developed in physical measurements and strength. His average percentile for standing and sitting height and weight is equal to the 28 percentile, whilst his psychophysical average is on the 11 percentile. His Binet diagnostic score is 11 years. His social ratings show him to be lacking in planning capacity (2) and also that he is irresolute and easily confused but not excessively so. He is not at all impulsive, nor according to Mrs. Nash's ratings, is he moody. Evidently his moodiness is increasing since this rating was given a year ago. He is somewhat simple and suggestible and a little silly. His last social rating of 29½ puts him just outside the socially efficient group. His high mentality may tend somewhat to overshadow his personality defects. In suggestibility he should probably get a worse rating and also in moodiness. However, there is little doubt that the Porteus tests have under-rated his general ability.

By the new form and assembling test he scores 9 years with the rank order of 46 in a group of 85 cases. This is probably about a correct indication of his social adaptability.

Case 5. M. M. Under-estimated by Binet

Case number five is an exceedingly well-adjusted boy who is as much under-estimated by the Binet as the last case was under-rated by the Porteus. By the Goddard revision of the Binet he scored 7 years 4 months and by the Stanford 8 years 6 months. His basal year by the latter was five years as he became confused in the right and left test in year 6. He said he had 11 fingers on his two hands (VII—1). In year IX he only succeeded in one test, the value of the stamps. He obtained, however, 12 year credit on the ball and field and succeeded in the memory for designs tests (10 year Stanford—12 year Vineland revision). Tests of practical judgment were evidently well done, though verbal tests were not as well accomplished. It is noteworthy that he scatters through seven years of the tests but is neither psychopathic nor epileptic.

This boy has been a model of good behavior during his sixteen years in the institution. In 1911 his school reports note that he is very persevering and earnest in his work. In drill was said to lack initiative and quickness and was very sensitive to criticism. In woodwork he did very good work indeed. In knitting he was said to have reached after very short instruction a stage to which it takes the ordinary children two years to attain. By the basketry instructor he was reported as working too hastily and with not enough attention to detail. Yet the next year he is reported as having completed the best basket ever made in the class. In 1913 the carpenter reports that he is the best boy he has had for a long time and that he appears to have a good sense and judgment above the ordinary. He was then a very reliable worker. In the cottage he was most helpful with little children.

In 1914 he was tried in printing press work. After a week's matching type he could not tell the difference between "b," "d," "p," "q." Nevertheless, after a little time longer he made fair progress.

In 1915 the basketry teacher reports "It is a real pleasure to have a boy like him in class. He attends to his own affairs and does his work so well."

The cottage reports are equally laudatory. He is fond of games, a faithful, good worker, modest, quiet, can enjoy fun, obedient, obliging. Uses good judgment and "is quick to see the opportunity to help another." Helps the small boys; whenever a toy is broken they take it to him to mend. Very sensitive, wishes he could speak more plainly (has an impediment in his speech), is honest and trustworthy. "Has not improved any in his work since last report, because his work has always been of the very best." He is very reticent, sensitive as regards his position as an inmate and "afraid to go to the laboratory in case they make him out to be a dunce."

Right up to the present this boy's reports have continued to be of the finest character. Last year he was given full responsibility for the delivering of goods by wagon from the institution store—a position of decided trust. The report on his work is: "He has done better than the last three normal employees. He is absolutely trustworthy." The carpenter reports also that he is able to do many repairing jobs without supervision. At the laboratory he recently did a most complicated job in laying down linoleum on the floor of a bathroom, using old material which had to be cut and matched and the work would have done credit to a well-trained normal adult.

It is quite evident that as regards self-management and

self-control the boy cannot be considered to grade with defectives. Yet he has a mental age of 8½ per Stanford-Binet with a consequent I. Q. of 53 if calculated on a 16 year basis and about 61 I. Q. if 14 years be taken as the average development. His only drawbacks are his speech defects, said to be due to a tongue tied condition, and certain educational disabilities in number work and reading. Yet though he works by rule of thumb methods his judgment is so excellent that he achieves better results than many who use more intelligent methods. For instance, his method of putting a screw in the middle of a window shade is to take the foot rule and measure off a foot from each end. Then he estimates his middle point between these two marks, using such good judgment that he is just as accurate as if he had measured the shade and then calculated where the middle point would be. His educational disabilities would of course prevent him from being a master mechanic, but that he would succeed as well as the average of our normal population of lower social grade there is not the slightest doubt.

His social rating is 23, the only traits in which he does not get first class ratings being irresolution and simpleness. He is somewhat over-sensitive to criticism and his responses to a new task which are being closely observed might savor a little of irresolution. His index, however, puts him in the group for whom very little social guidance is necessary for success. A second rating one year later also gave him an index of 23. His Porteus rating of 13 years may be a little high. His Porteus diagnostic score of 12 years more nearly reflects his mental level. It is very significant that although his Binet age is only 8½, his Binet diagnostic is 11 years. This means that it is in the tests most affected by educational experience that he fails whilst in the tests of

good native ability he succeeds. Such a wide difference between the Binet age and diagnostic score should always render the test "suspect."

This case illustrates the futility of a "mental age" or I. Q. definition of mental defect. Terman's proposed border-line of normality at 70 I. Q. is in this case fallen far short of, yet the boy is normal from the social standpoint. Nor can it be contended that the institution training has made this case what he is. Every record from the beginning speaks of his ready adaptability except to school tasks. It is not even likely that this is an isolated case. The recent army examinations would indicate that it may be duplicated in thousands of instances where the Binet I. Q. would fall well below 70 and where the individuals concerned are functioning with average success in society.

Case 6. Over-estimated by the Porteus Test

This boy is now 32 years of age and was admitted to the institution twenty-three years ago at the age of nine years. His Binet rating by the Goddard was 7 years, by the Stanford 8 years. His Porteus age was 11 years, with a rank order in 100 cases of 21. His social rating was 37, with a rank order of 58. It is evident that if his social rating is correct his Porteus age is too high. It is noteworthy that he fails completely in a test two years below his mental age, so that his Porteus diagnostic is 10 years. This lowered diagnostic score is symptomatic of either an over-rated mentality or of psychopathic tendencies.

A report given in 1909 by the supervisor of the boys' cottages gives the following description of his traits—"cranky, quarrelsome, stubborn, obstinate, excitable, sensitive." In his opinion the boy would go back rather than

improve. The school director, however, reports him as being quiet, obedient, cheerful, affectionate and good tempered. His worst defect according to this report is "a smile that won't come off." Here are two apparently contradictory reports, the one reflecting his cottage life, the other his school adjustments.

In 1914, five years later, his cottage report speaks of his being clean and tidy but "in the dining room he often shows a bad temper, losing his head completely. He is liable to do anything at all,—perhaps he will drop a whole trayful of dishes. One day one of the boys teased him outside, but instead of going for the boy he ran to a nearby post and pulled it out of the ground." Usually he was contented and happy. Another report from a different source refers also to his violent temper, easily aroused, when he breaks the dishes. "He has broken the bottom out of the iron basket in the dish washing machine." The matron reports that he has a surly temper at times and shows "signs of insanity." From the clothes mending room come, however, very good reports as to his ability and interest.

The subsequent reports are much of the same tenor. Industrially he is a steady, useful worker with very fair ability. Socially he is ill balanced and apt to fly into senseless rages, in which he works much damage. If he is teased he will pick up anything and throw at a window. A report in 1920 states that he costs the institution monthly about five dollars for broken windows.

According to his family chart he is descended from a man supposed to be a half-breed Indian.

This is evidently an excellent instance of a person having the capacity for self-support but not for self-management. The Porteus record reflects his industrial capacity,

whilst the Binet age indicates better his mental level as regards self-management. His native ability is reflected also in an increased Binet diagnostic score. His psychopathic tendencies are indicated by his lessened Porteus diagnostic score and also by the Porteus inverted test in which he scored 2 years less than his original Porteus. His brain capacity is on the 1 percentile. The form of his head is also very abnormal. He has an almost average head length but his deviations from the normal in breadth and height are respectively 2.66 and 2.2 times the normal standard deviation. Both his length-breadth and length-height indices are consequently very much below the normal average indices. This marked irregularity in head form is somewhat characteristic of the psychopathic. His physical and psycho-physical averages are both much below the normal medians. His Knox cube test was 14 years and form-board test 11 years. His basal year per Binet was 5 years as he failed to recognize the coins in year six. He failed in the two memory tests for year VII and the picture description, but succeeded in the ball and field test and comprehension test for year VIII. He arranged the weights correctly in year IX and succeeded in repeating 4 digits backwards in year X—even though he had failed in the repetition of three digits backwards in year VII. His practical judgment is reflected in the arranging weights test and in the ball and field test where his response was almost deserving of 12 year credit.

This case illustrates again the advantage of combining the Binet-Porteus ages as an index of social adaptability. Either test alone may give an exaggerated view.

He also represents an example of the value of institution care for the psychopathic defective. There is not the

slightest doubt that, though he might have developed the ability to support himself in the community, his silly manner would have made him extremely liable to constant teasing which in a short time would have robbed him completely of self control—with perhaps disastrous results to himself and others. His outbreaks here are infrequent and on the whole he leads an industrious, useful and contented existence. The case also exemplifies the fact that decided psychopathic tendencies may be overlooked in the schoolroom where the work is continually supervised. It should be noted that it is supervision not of himself but of his associates that this boy requires.

CHAPTER VII

BINET-SIMON SCALE

The Binet-Simon tests, in their various modifications, have been repeatedly referred to in the other sections of this collection of studies. Their relation to social adaptability has been discussed and case histories selected to illustrate our conclusions. Our ideas as to the limitation and value of these tests have been fully set forth. Hence, comparatively little space may be devoted to their further discussion.

It should be reiterated, however, that we do not consider that the test verdicts are *incorrect* except within the ordinary limits of the probable error of the scale. This has been shown by Burt[1] to be about a year of mental age. It is not the test results themselves that are open to question, but merely the interpretation that is put upon them. We do, however, hold that in a large proportion of cases their verdict is insufficient to found either mental diagnosis or prognosis upon. In other words, a Binet mental age does not always give a correct idea of social adaptability. In a previous publication[2] we have summarized these observations on the Binet as follows:

"The lack of relation between actual social worth and the Binet test ages of some defective individuals is due to the fact that the tests favor certain types of ability. An

[1] "The Educational Abilities and Disabilities of Special Class Children." By Cyril Burt.

[2] "Condensed Guide to the Binet Tests." By S. D. Porteus and Helen F. Hill.

analysis of the character of the individual tests shows the following facts: No less than 57 questions out of 74 require an oral response, whilst language development, either from the standpoint of comprehension, range of vocabulary, descriptive or defining power, is the main capacity tested in 50 per cent. of the tests. Tests very largely dependent on previous educational training make up 31 per cent. of the total. Immediate memory is tested directly in 21 per cent. of the tests, and in 50 per cent. of the alternative tests, whilst mediate or immediate memory is one of the main factors in success in no less than 48 per cent. of the total tests. What we may designate as tests of practical ability, requiring a motor response, constitute only 17 per cent., whilst arithmetical ability, with 12 per cent., has almost as much attention. The criticism that may justly be founded on this analysis is that the tests are far too 'literary.' They favor the glib-tongued, quick-thinking child, the child who has had a good educational environment, the child who memorizes readily and to whom expression is easy, and who, therefore, shows good scholastic promise. On the other hand, they do not do justice to the child with capacity for achievement in manual and industrial pursuits, who is shy and unresponsive in oral tests, or who lacks facility in language expression, or whose mental operations are slow but sure, or who has been unfortunate in his educational background. In brief, whilst designed to test general ability, they do not succeed in being sufficiently general to suit all types of intelligence."

Out of the examination results of 1000 school children by the Stanford-Binet the mental ages of 945 cases between 6 and 13 years were given in the form of a percentile table. These figures are reproduced in Table 31.

TABLE 31

STANFORD-BINET TESTS

Percentile Tables — Porteus 1916

945 Cases

Percentile	6-yr. chil. 71 cases	7-yr. chil. 124 cases	8-yr. chil. 152 cases	9-yr. chil. 140 cases	10-yr. chil. 119 cases	11-yr. chil. 114 cases	12-yr. chil. 127 cases	13-yr. chil. 98 cases
0	5^{4}	4^{6}	6^{6}	6^{6}	7^{4}	7^{8}	8^{0}	9^{2}
10	6^{0}	6^{10}	7^{4}	7^{9}	8^{9}	9^{1}	9^{8}	10^{3}
20	6^{5}	7^{2}	7^{10}	8^{4}	9^{1}	9^{8}	10^{2}	11^{4}
30	6^{10}	7^{6}	8^{2}	8^{8}	9^{4}	9^{10}	10^{6}	11^{8}
40	7^{0}	7^{8}	8^{3}	8^{10}	9^{6}	10^{2}	11^{2}	12^{2}
50	7^{4}	7^{10}	8^{6}	9^{0}	9^{8}	10^{9}	11^{5}	12^{6}
60	7^{6}	8^{0}	8^{8}	9^{4}	10^{0}	11^{2}	12^{0}	12^{10}
70	7^{10}	8^{2}	9^{0}	9^{6}	10^{4}	11^{8}	12^{4}	13^{1}
80	7^{11}	8^{4}	9^{3}	9^{10}	11^{0}	12^{2}	12^{9}	13^{6}
90	8^{2}	8^{7}	9^{9}	9^{3}	11^{6}	12^{8}	13^{1}	14^{3}
100	9^{2}	9^{2}	11^{4}	12^{3}	13^{6}	13^{10}	15^{0}	15^{4}

It will be seen by reference to this table that the median age of 6 year children (average age about 6.5) was 7 years 4 months, showing that our 6 year children found the test too easy. For 7 year children also the standardization was too easy. From 9 years on the tests were too difficult, the median for children 12 years 6 months being more than a year below this level.

The thousand cases from which these 945 cases were taken were a fairly representative group of Australian school children. They consisted of about 250 rural school children, about 250 children from schools in a middle-class suburb, and about 500 children in schools in industrial suburbs in Melbourne. The group certainly differed in constitution from Terman's, whose subjects were children drawn from the middle-class schools in California cities. The different social grade of our cases may explain some of the differences in our results. Australian children, it may be objected, may differ greatly from American children, but there is probably no greater difference between Californian and Australian children than between Californian children and children in Eastern U. S. A. The Australian group would be substantially of Anglo-Saxon stock.

The medians of the above table bear out the view that the tests are rather too easy in the lower years and too difficult in the upper years. As far as diagnosis is concerned, too difficult standardization is a more serious defect than too easy standardization. It is particularly important that the test should not be too difficult about the critical ages of 9, 10 and 12. The form of the Binet test now used at Vineland is a modification of the Stanford-Binet. The alterations that have been made are not many, but have the tendency to lessen the difficulty of the tests at these critical age

levels. Although there are not many changes in the standardization of the tests, we have ventured to modify the test procedure and scoring in a number of places. The chief advantage of our "Condensed Guide" lies, however, in the fact that it was put up in a cheap and usable form, together with a simple four-page record sheet. Terman has now issued his own "Condensed Guide," but at the time of our publication the tests were not to be found in a condensed form.

As the diagnostic value of the scale lies in its application to subnormals and border-line cases, it was determined to discover the relative difficulty of the single tests for such cases. To do this, we took the percentage of cases at three age levels who failed in any single test of the series. The three levels were the age below the test in question, the age at which the test is placed, and the age a year in advance of this level. For example, test X—3 (memory for designs), would be given, of course, to all children 9 years mentally, 10 years mentally and 11 years mentally. Accordingly, we added together the percentages of failure by children mentally 9, 10 and 11. We found that of all 10 and 12 years tests it had the biggest aggregate percentage of failures. Hence, we decided to place it among the 12 year tests instead of the 10. This would result in easing the scale somewhat. Confirmation of this procedure is gained through a similar comparison of percentage of successes scored by the normal children of the previously mentioned investigation. It was found that only 54 per cent. of all our 10 year normal children and only 53 per cent. of all of our 11 year cases passed this test. Eighty per cent. of our 12 year cases, however, passed it. Hence, its re-standardization seems quite justified.

Another test which is much too difficult for defectives is

IX—4 (repeating 4 digits backwards). An even greater proportion of defectives were unsuccessful in this test. The aggregate percentage of failures in this test of children mentally 8, 9 and 10 was 180 per cent., as against 156 per cent. for the memory for designs test. Strange to say, this test is one that appears to have peculiar difficulty for defectives, as our results showed that with normals it was not misplaced. As a matter of fact, 76 per cent of the normal 9 year cases passed it successfully. However, in order to lighten the difficulty of the scale, it was advanced to year 10 and the alternative test of counting the value of stamps took its place in the regular scale. Other changes affecting the difficulty of the scale in its upper years are the reduction of the number of words necessary to secure a pass in the vocabulary tests for years 10, 12 and 14. These tests are naturally most dependent on previous environmental experience so that the child of better social grade and education is favored.

In comparing the normal children's results it was found that when we considered only the children of lower social environment these changes in the vocabulary tests were quite justified. For the children of better social grade the tests were apparently well standardized as Terman scores them. However, as defectives more often come from the lower social grades, it was thought advisable to ease the conditions of success somewhat.

The test has also been modified by presenting only half of Terman's list to the child. The selection of our half-list also favors the child as the relative difficulty of our list is less than one of Terman's half-lists. Other changes were the omission of one test from the 12 year series and the transposition of two others to the ranking of alternative

tests. This reduced the number of tests in Year XII to 6—uniform with other years.

The difficulty of the tests in the lower years has been increased by altering the scoring condition or the position of one or two tests. Defectives, because of their advanced chronological age, usually found the bow knot test (VII—4) too easy, so that we placed this test as an alternative, using in place of it Terman's alternative test 2 (repeating 3 digits backward). This is a more difficult test for very young children and defectives. The scoring conditions for two tests in year 6 have also been made more difficult. These alterations should have the effect of making the tests more difficult at the 5 and 6 year levels where our results showed that the standardization was too easy.

ANALYSIS OF BINET RESULTS

Reference has already been made to the cases in which the Binet results do not reflect the social adaptability as judged by their social rating index. In order to show how children with certain disabilities are handicapped by the inclusion of too many tests of a similar nature, or the grouping together of such tests in certain years, we have undertaken an analysis of the Stanford-Binet and Goddard-Binet results of the children who were under-estimated or over-estimated by the tests in comparison with their social ratings. These are the cases previously referred to as belonging to the group of 100 cases examined by Miss Babcock. 11 cases were over-rated by Goddard-Binet and all were, with one exception, at 8 and 9 year levels. We will, therefore, examine their test records above the 7 year level in order to discover from what tests they received the

most credits and hence to what they owe their high scores. Test VIII—3 (the repetition of the days of the week) was passed by all the over-rated group and is, in any case, a very mechanical test. It was placed as an alternative test in year 7 by Terman. Test VIII—I (differences between fly and butterfly, etc.) was passed by all these cases except one. Terman has dropped this test also a year. It is evident, then, that these cases were getting 8 year instead of 7 year credit for these tests. The most difficult test for this group was the counting of the value of the stamps (VIII—4) which we use in the Vineland modification as a 9 year test and which Terman had relegated to the position of an alternative. In Year IX all of this group but one passed the test for the naming of the months in order—another test of a rather mechanical nature, dropped by Terman to the position of an alternative test. This test is of the same nature as the days of the week test, and to have two tests of such a similar character in two successive years is inadvisable. Success in these two tests depends mainly on previous experience. For children who come from schools where they are taught to recite the months in order, it has very little value as a test of 9 year intelligence. Eight out of 11 in the group knew the test preceding the "months" test, viz., "knowing the date." Here again is an injudicious grouping of tests of a too similar nature. The choice of two tests of a different nature in place of these two tests would have reduced the scores for this group. As soon as a more practical test of memory—such as the drawing the designs test (X—2)—is reached we find only one boy succeeding.

Five boys passed in Test X—3 (repeating 6 digits), and two in the 7 digits test in Year XII. These cases evi-

dently owe their high score mainly to good rote memory development—an ability with probably close relation to school attainments but with little if any relation to social adaptability in the levels of society in which the dull or defective function.

From this analysis it is evident that the Goddard revision favored a certain type of child mainly because of its great ease at an 8 year level and possibly because of the grouping together of memory and number tests in this year of mental age where four out of five tests are of this nature. As regards the under-rated group of 7 cases, we find that they are all, with one exception, at a 7 year level. We find that every one of these cases fail in Tests VIII—2 (counting backwards), and VIII—4 (counting stamps), whilst only 3 of the 7 could repeat 5 digits. These results indicate a special disability in number work in all of the cases, and of rote memory in some. Two of the cases failed in the counting test (13) in Year VII and 2 in knowing right and left in Year VI. The arithmetical test of making change in Year IX was too difficult, of course, for those with number disabilities. These observations do not apply to the generality of cases, and so need not be taken to indicate that the scale should be altered, but are made for the purpose of showing how a special disability may handicap a child with otherwise good intelligence.

A comparison with the Stanford-Binet results may be more pertinent in view of the widespread use of this revision. The children who are most misplaced in relation to the social rating scale number 20, 11 of whom are over-rated and 9 under-rated. These are chosen from the same group of 100 cases from which the Goddard results were taken. The tendency of the Stanford is to over-rate even more

seriously than the Goddard. The reason for this is that it shifts the emphasis from rote memory tests to language tests. As 10 of the 11 over-rated cases are psychopathic, in cases of which type facility in language is frequently well marked, the over-rating is not at all unexpected. These over-rated cases are, on the average, little over the 9 year mental level. Examining the tests from 8 years upwards, we find that 2 failed in the ball and field test (VIII—1). In the 9 year test the date was known by 8 out of 11, but only one could repeat 4 digits backwards. The second highest percentage of successes was in the sentence construction, but even in this less than 50 per cent. of the group succeeded. It is all the more remarkable, then, that 9 out of 11 score successes in the vocabulary test and 10 out of 11 in the comprehension test in Year X—both tests of language facility. Even in the vocabulary test for Year XII more than 50 per cent. scored credits. Two cases (both testing 9 years) obtained credits in the vocabulary test in Year XIV. It is quite evident that tests of this nature favor certain psychopathic cases. This, again, is not to be taken as a criticism of the scale as a whole, although it is the writer's conviction that the scale could be materially improved by a lesser emphasis on so-called "linguistic" tests at the 8 and 9 year levels. The substitution of several tests of a more concrete nature would lessen the likelihood of over-rating the psychopathic child. On the other hand, the emphasis on linguistic tests above the 12 year level would seem to be quite justified. It is at the levels of intelligence above the defective limits that Terman's views [1] regarding the relation of language development to intelligence fully apply. At either extreme of the distribution of ability, i. e., in the

[1] "Measurement of Intelligence." By Lewis M. Terman. P. 265.

genius and the defective, it is not true that "language growth mirrors the entire mental development."

The under-rated cases test about 7 years, so that we may examine their records at a 7 and 8 year level. It will be seen that 4 out of 9 cases failed to repeat 5 digits in Year VII, indicating inferior rote memories. Seven out of the 9 failed to count backwards from 20, all failed in the similarities test and 7 failed in the definitions test. In Year IX all failed to give the date correctly or make change. In Year X, however, three succeeded in drawing the design from memory, a test which is so difficult for both defectives and normals that we have placed it in Year XII. It is evident that rote memory and number tests are the cause of the downfall of these cases who are under-rated by the Stanford. This was also the case with the Goddard revision. The under-rated are not so much handicapped by language tests as the over-rated are favored by them.

Unfortunately for the chances of improving the scale, an increase in the difficulty of the tests that would make it harder for the over-rated would make it even more difficult for the under-rated. However, the discarding of certain tests of rote memory and language facility and the inclusion of tests of practical intelligence would help to balance the scale better in its middle levels.

THE DIAGNOSTIC SCORE

The calculation of the percentage of failures over a 3-year range for the tests gives a key to the tests which are most difficult for defectives. From this list (published in the "Condensed Guide," 1920) we selected 8 tests from which may be obtained what we have called the diagnostic

score. These tests and the method of scoring are as follows:

Test

V-5 (Patience)
VII-3 (Repeating 5 digits)
VIII-1 (Ball and field)
IX-2 (Weights)
X-3 (Repeating 4 digits backwards)
X-6 (60 Words Association Test)
XII-3 (Memory for Designs) Terman X-3
XII-1 (Vocabulary) and XII Alt. 2 (Ball and Field)

To count the score, reckon 6 years for the first test passed and an additional year for each succeeding test passed. The procedure is to give both of the last 2 tests but to allow only 1 year's credit, even when both are passed. This diagnostic score is not intended to be used as a brief scale or as a substitute for the main scale. Its value lies in the fact that it may be regarded as providing an additional diagnostic symptom. A child who scores 11 years or more by the diagnostic score is little likely to be feeble-minded, no matter what his mental age may be. At the same time, the mental age gives us some valuable information about the child's aptitudes which the diagnostic score does not. Both are useful. Of the children who score 11 years or over by this diagnostic score 72 per cent had social ratings of 30 or less. Of children scoring 10 years by the diagnostic, 25 per cent. had social ratings of 30 or less. Only 15 per cent. of children scoring 9 years had social ratings below this figure. Hence the higher the diagnostic score the greater the social efficiency tends to be. Taking the 100 cases of Miss Babcock's investigation, we found a

correlation of .65 between the diagnostic score and the social rating, as against .60 for the mental age and the social rating. Hence we may say that in relation to the social rating scale a Binet diagnostic score of 11 years or over is of significance as an additional indication of probable social adaptability.

Taking this group of 100 cases as a basis of investigation, we may compare their Binet diagnostic scores with their social ratings, the figures being given in Table 32.

TABLE 32

BINET DIAGNOSTIC SCORES AND SOCIAL RATINGS—100 CASES

Soc. Rat.	No.	11 yrs.	%	10 yrs.	%	9 yrs.	%
-28	20	11	55	3	15	3	15
29-36	52	5	9.6	3	5.75	10	19.2
37-54	28	0	0	2	7.15	2	7.15

The first column gives the social rating limits of three groups. The first group are those who may become socially sufficient with a certain amount of guidance and control. The next group consists of the institution workers who may be trained so that a small proportion of them may attain to self-dependency. The third group, whose ratings range from 36 upwards, consists of the less trainable cases with very little capacity for self-management. It will be noticed that this group contained no cases whose diagnostic scores ranged as high as 11 years and only 2, or about 7 per cent., who scored 10 years by the diagnostic. The group higher in social ratings contained 5 cases with diagnostic scores of 11 years. Three of these 5 cases had social ratings

of 28, 29 and 30, respectively, and were, therefore, very close to the border-line of social sufficiency. The two others had social ratings of 36 and 35, respectively, and each belong in the psychopathic group, whose condition has but little relation to mental age. In the next higher group, 11 cases, or 55 per cent., had diagnostic scores of 11 years or over.

Probably the best indication of the diagnostic value of the diagnostic score lies in a consideration of both the mental ages and social ratings of cases scoring 11 years or over who have been classified in the various groups of our last investigation. Whilst some normal individuals do not gain diagnostic scores of 11 or over, it would be useful to know what the value of this score would be as an upper limiting level of feeble-mindedness. Out of all the cases for whom the diagnostic score was computed and for whom social ratings were available, we found 11 cases scoring 11 years or over who are classified as being at feeble-minded levels, i. e., have average Binet-Porteus I. Q.s below 75. Table 33 gives the social ratings and scores.

It will be seen that 7 out of these 11 had social ratings below 30 and hence were on the border-line of social efficiency. The total number of cases having diagnostic scores of 11 or over was 52. Out of this number only 4, or less than 8 per cent., were placed amongst the definitely socially incompetent by the social ratings scale. Two of these were psychopathic and their social disability would be determined irrespective of their mental age. We may, therefore, state that a diagnostic score of 11 years or over has a positive value in that it is very improbable that a child making this score will be feeble-minded. In other words, our tables show that some normals make diagnostic scores below 11 years, but extremely few defectives score up to or

above this level. Consequently, though we may say that a person scoring 11 years or over is almost certainly not feeble-minded, we cannot say that the converse is true, viz., that a person scoring below 11 years is feeble-minded. In this respect the Binet diagnostic score is different from the Porteus maze test in which failure is more significant than success. As regards the diagnostic score, success is more significant than failure.

TABLE 33

SOCIAL RATINGS IN RELATION TO MENTAL AGES—ALL CASES

Soc. Rat.	Group	Binet Diag.	Binet	Porteus
29	F. M. W. Adj.	11	9^{4}	7
31	"	12	10^{9}	10
21½	"	13	9^{9}	8
33	"	13	9^{4}	11
23	"	11	9^{7}	10
29	"	11	11	6
28	F. M. Del.	11	9^{2}	12
28	"	11	10^{8}	7^{6}
37½	F. M. Psy.	11	9^{2}	12
26	"	13	11^{8}	8^{6}
45	"	11	8^{3}	12

It will be understood that we do not by any means regard the diagnostic score as a sufficient diagnostic measure. All that is claimed for it is that it assists in an interpretation of the Binet score and is therefore of some diagnostic value.

The tests of our diagnostic score do not coincide with "crucial" tests such as those indicated by Burt[1]. His selection is based evidently on a different method and on a different form of the Binet Scale. Two tests in his lists (arranging weights and drawing designs from memory), are the same as ours.

SCATTERING IN THE BINET

The classification of our 464 cases by types gives us an opportunity to present evidence on a very interesting question, viz., the occurrence of scattering in the tests of psychopathic children. The procedure adopted was to take the Binet records of 89 children with psychopathic tendencies and compare them with the records of almost equal numbers of well-adjusted cases selected at random.

As regards the range of "scattering," i. e., the number of years above the basic age in which the child received credits, the psychopathic had a slightly greater average amount of scattering, but the differences were too small to make it appear that scattering was very characteristic of psychopathy. Taken in classified groups, the psychopathic, however, show a greater average scattering for the group between 55 and 75 I. Q., but as regards the dull normal the well-adjusted scattered almost the same as the psychopathic.

Dr. Mateer, in an article previously quoted, gives as one of the psychological indicators of psychopathy a range of scattering in the Binet test of more than 4 years. Treating our results in this way we found that in two mental age groups the psychopathic showed a higher percentage of cases with this degree of scattering than did the well-adjusted. Only in one group were the differences at all marked.

[1] "The Definition and Diagnosis of Mental Deficiency." By Cyril Burt. Studies in Mental Inefficiency, Oct. 1920.

On the whole, our results cannot be said to confirm the view that "scattering" is a very reliable indication of psychopathy. Only 35 per cent. of our cases with psychopathic tendencies showed scattering extending over a range of more than 4 years and 23.6 per cent. of the well-adjusted also scattered to this extent.

The objection may be advanced that our cases did not consist of definitely psychopathic cases, but merely of those with less marked tendencies. This is undoubtedly true, but in previous chapters we have shown the great importance of these tendencies so that it is just these tendencies that, from the therapeutic standpoint, we wish to detect. When the case becomes definitely or markedly psychopathic we certainly do not need the mental test indicators to inform us of the fact. An ounce of observation in such cases may be as good as a ton of testing.

The figures and percentages regarding scattering are given in Table 34. These results appear to confirm the conclusions of Wallin, who has recently stated his findings to the effect that scattering in the Binet has but little relation to psychopathic conditions.

In order to summarize all the comparisons that have been made between the well-adjusted, psychopathic and delinquent groups the percentiles and I. Q.s have been averaged and presented in Table 35. The figures of this table will serve to emphasize the superiority of the psychopathic in brain capacity, their poor strength in relation to their bodily development, and their lower Porteus age in comparison with their Binet. The relative superiority of the delinquent groups in psycho-physical measurements is also indicated, whilst the superiority of the well-adjusted high-grade cases in Porteus average is also shown.

TABLE 34

SCATTERING IN BINET

Group	No. of Cases	Average Range of Scattering	No. Scattering 5 years+	Per cent.
Well Adjusted below 55 I. Q.	41	3.28 yrs.	7	17%
Psychopathic below 55 I. Q.	41	3.1 yrs.	6	14.6%
Delinquent below 55 I. Q.	15	3.53 yrs.	2	13.3%
Well Adjusted above 55 I. Q.	34	3.7 yrs.	8	23.3%
Psychopathic above 55 I. Q.	34	4.76 yrs.	18	53 %
Delinquent above 55 I. Q.	33	3.78 yrs.	11	33.3%
Well Adjusted above 75 I. Q.	18	4.77 yrs.	7	39 %
Psychopathic above 75 I. Q.	14	4.71 yrs.	7	50 %
Delinquent above 75 I. Q.	15	4.53 yrs.	6	40 %

Finally, the figures of Table 35 have been made the basis of the graphs of Figs. 9, 10, 11. These show the average psycho-graphs for each group. It will be noted that the typical well-adjusted graph tends to resemble somewhat a capitalized M, whilst the psychopathic psychograph resembles a W or a V. The psychographs have been constructed by joining the points representing the average percentiles and I. Q.s on a scale.

TABLE 35

AVERAGE MENTAL AND PHYSICAL MEASUREMENTS

Group	No. of Cases	Av. Brain Percentile	Av. Phys. Average	Av. Psycho-physical Ave.	Av. Binet I. Q.	Av. Porteus I. Q.
F. M. Stable below 55	171	13	34	11.3	38	31
F. M. Stable above 55	71	22	45	22.6	61	66
F. M. Psychopathic below 55	51	44	41	13.3	41	33
F. M. Psychopathic above 55	34	42	40	19.7	65	62
Feeble-minded Delinquent	50	30	48	31.4	58	61
Dull Normal Well Adjusted	29	36	52	34	76	87
Dull Normal Psychopathic	15	63	68	37.4	85	84
Dull Normal Delinquent	43	38	55	45.9	81	94

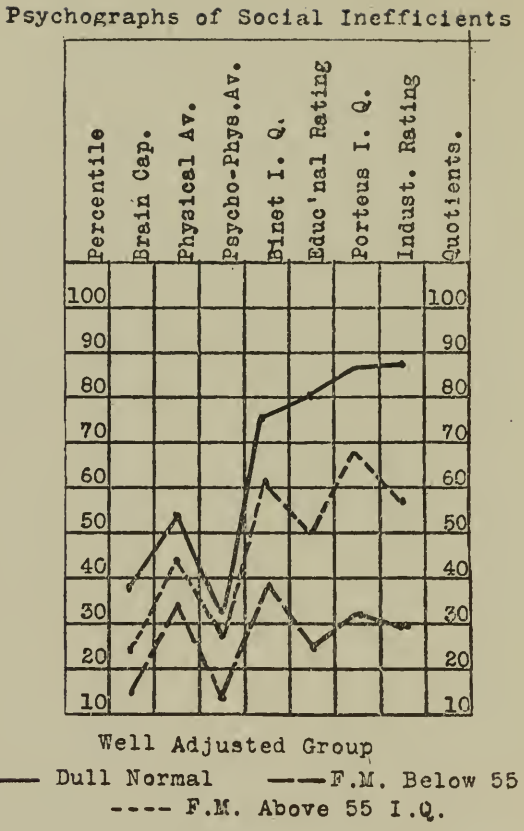


Fig. 9. Psychograph Showing Average Percentiles and I. Qs. of Well-Adjusted Group.

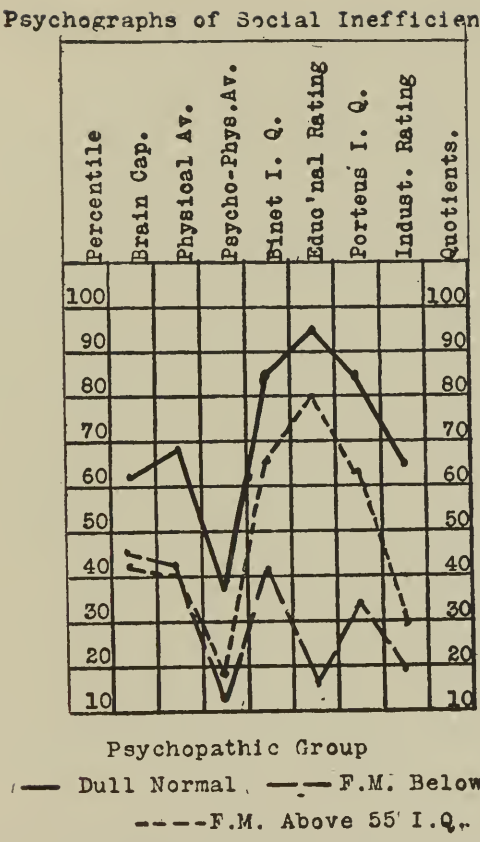
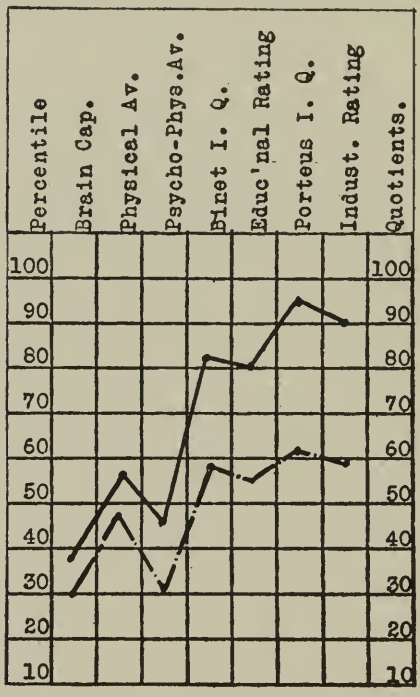


Fig. 10. Psychograph Showing Average Percentiles and I. Qs. of Psychopathic Group.

Psychographs of Social Inefficients



Delinquent Group

— Dull Normal

—·— F.M. Above and Below 55 I.Q.

Fig. 11. Psychograph Showing Average Percentiles and I. Qs. of Delinquent Group.

CHAPTER VIII

PORTEUS FORM AND ASSEMBLING TEST

Reference has already been made to form-board test results and their relation to social adaptability. These statements were to the effect that it is an excellent test up to about the level of 8 years' mentality, but that its value decreases as we approach the levels of border-line mentality. The ordinary form-board provides a problem which requires a comparatively short and intensive effort. It is too short a test to bring to light certain important characteristics of children's behavior such as inability to sustain interest. Another disadvantage is that because of the limited number of forms to be matched, the score is affected by accidental successes. Certain of the forms, such as the circle, are so easily recognized that a difference in the time of fitting the inset is almost wholly a matter of when the eye happens to fall on the right space. In the case of the very young child a long time is frequently taken in persisting in the attempt to fit the inset into a closely allied form, as, for example, the rectangular block into the square hole. Another child may happen to try the rectangle in the right space first. Frequently it is not the child's perception of form which is at fault, but his ability to manipulate the block. This is the case when a child attempts to fit the block into the right inset but at the wrong angle. When it finds that it does not go in readily it frequently tries it in the other spaces. With older children this does not apply, but the test then resolves

itself, not so much into a test of quickness of perception as a test of speed of movement. Speed of movement, as in tapping tests, has been shown not to have a very high correlation with intelligence except with lower-grade cases. An improvement in the form-board as a test for cases of the lower mental ages would be to make it more of a test of perception of form and less of a test of skill in manipulation. In addition, the test should provide more forms to be matched, as in this case the field of choice is larger and the effect of accidental successes is diminished. Of course the factor of chance in finding the right form quickly cannot be eliminated, but the provision of more forms diminishes the relative effect of accident on the total time consumed.

Generally speaking, the form-board is a fine illustration of a test which is excellent for the lower levels of intelligence but in which the importance of the intellectual factor involved diminishes the more mature the cases examined are. On the face of it, it is extremely unlikely that a test which does not alter in complexity but is scored in speed alone will be suitable for a wide range of mental ages.

By using pictures instead of actual forms the test eliminates the factor of skill in manipulation. The picture completion test, however, which depends upon a recognition by the subject of logical relations, usually provides a situation rather too complex for analysis by defectives. The correct interpretation of a pictured situation, if rightly placed in the Binet series, belongs to about a 12-year level. Where only half the picture is presented and this must be logically interpreted and completed, the task is, except for the very simplest situations, still harder, and beyond the level of the majority of defectives. Tests of this nature are undoubtedly useful, not so much in providing diagnostic criteria for

mental deficiency, but in enabling us to make an analysis of mentality above feeble-minded levels.

Other picture-completion tests such as Dearborn's are extremely ingenious and under certain circumstances very valuable. They make use of the multiple choice method. The postman is depicted performing the action of handing something to a woman and the appropriate object must be selected out of a number. It is evident, however, that correct standardization of these pictured situations is so difficult as to be almost impossible. Success depends not so much upon the inherent difficulty of the interpretation, but upon the relative familiarity of the situation to the child. In other words, previous experience affects success very greatly. If situations could be depicted that are equally familiar to all children then intelligence in interpretation might be the more easily evaluated. It is doubtful, however, if the definitely defective have sufficient intelligence to interpret such an incomplete picture correctly. Hence tests of this nature, in contradistinction to the form-board, are better for the levels of intelligence above the lower limits of normality. One of the advantages of the tests of this nature is that an actual situation often occurring in real life is represented. The form-board test has an additional advantage as regards the testing of defectives in that it deals with concrete material. In order to test the ability to accomplish an actual task in mechanical construction various tests have been proposed. One of the best known of these is the Stenquist test, which consists of ten objects the parts of which must be assembled in as short a time as possible. The value of this test for diagnostic purposes is lessened because it cannot be graded to suit the lower levels of intelligence. Certain defectives may make relatively good scores

in this test but this is due to their previous experience and training in mechanical construction. Another and simpler assembling test has been proposed by Dewey, Child and Ruml,[1] in which the problem given to the child is to assemble the parts of a toy wagon in such a way that it will run. This test is ingenious, but it, too, like any other mechanical construction test, is a test of an ability specially developed in some children. Interest in mechanical construction varies with different children at different ages. All children have not the same interest in building except perhaps when very young, and then in most cases it is not the building instinct that is indulged as much as the destroying. The baby often piles his blocks as much for the pleasure of seeing the pile topple and fall as to see it stand up. It is the exceptional child who wishes his mechanical construction to remain without being torn apart again. In the same way whilst all children's interest in pulling a wagon might be somewhat the same, boys differ very greatly in their interest in putting it together. As the test must be scored on a speed in construction basis, it is evident that skill in manipulation is one of the main factors involved. This, too, will evidently be affected very largely by previous experience.

Another disadvantage in this type of assembling test is that the task is not graded in complexity as only one toy is to be constructed. As before pointed out, if the complexity of the task cannot be varied it is very unlikely to suit a wide range of mental ages.

The missing feature test such as was used in the army examination has some excellent features. In a previous investigation, however, when this test was tried out in conjunction with three others using as subjects a group of high

[1] "Methods and Results of Testing School Children." By Dewey, Child and Ruml, 1920.

grade defectives it was found that it had not as high a correlation with social adaptability as was expected and, in fact, had the lowest coefficient of the four.[1] This correlation might have been affected by the boys' varying experience with the articles in which the missing feature had to be indicated. Otherwise, if this explanation does not hold good, the lower correlations are evidence that the intellectual factors involved in the detection of a missing part of an object have not much relation to social adaptation.

In view of the above criticisms it seemed desirable to attempt to devise a test which would combine the good points of a form-board, a mechanical construction or assembling test and a missing feature or picture completion test. To be serviceable for diagnostic purposes such a test should be applicable up to the upper levels of feeble-mindedness, should not be dependent largely upon manipulative skill and should by its relative simplicity be freed as much as possible from any special appeal to the interest of certain subjects in mechanical construction. In short the ideal was to evolve a test using concrete material, but with as large an ideational content as possible. By a combination of the form-board with the assembling plan, speed of identification of form could be tested along with ability to perceive the relation of parts of objects. Accordingly pictures of objects familiar to the children were chosen and their respective parts represented in such a way as to present, in their assembling, a problem of increasing complexity. The objects finally chosen were a hammer, a wheelbarrow, a knife, a coffee pot and a chair. Pictures of these were obtained and then their parts were drawn on a large cardboard sheet. (See Figs. 12 and 13.) The respective objects and parts were as follows: Hammer—handle and head; wheelbarrow—body and

[1] "Porteus Tests—Vineland Revision." Page 21.

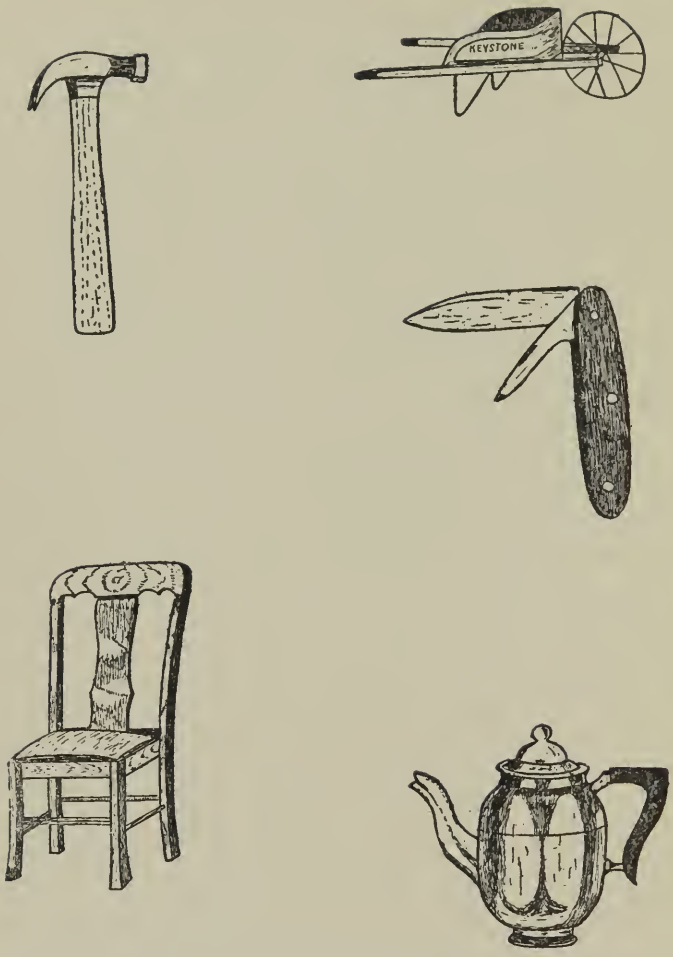


Fig. 12. Form and Assembling Test

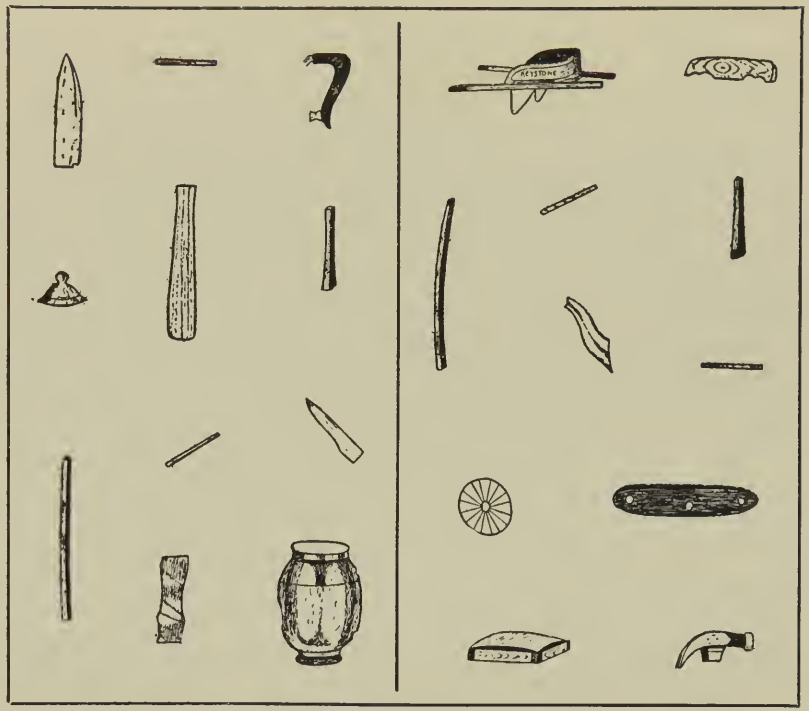


Fig. 13. Form and Assembling Test

wheel; knife—large blade, smaller blade and handle; coffee pot—body, spout, handle, and lid; chair—seat, back, two long back legs, two short front legs and four stays joining the legs. These parts were drawn on separate pieces of cardboard and fastened with glue in various positions on the sheet as shown in the figure. Duplicate parts to match these were then drawn on rectangles of cardboard and placed in haphazard position beside the large sheet.

The subject was then instructed to match the drawings by placing the separate pictures upon them, the time being taken by a stopwatch or by the seconds' hand of an ordinary watch. If an error was committed the test was not stopped, but the examiner unobtrusively corrected it by picking up the drawing wrongly placed and replacing it with the unmatched forms. No account in the scoring was taken of these errors as the time taken was increased by the replacing of the forms. The test continued until all the forms were placed correctly and the total time was then recorded.

When this part of the test was completed successfully the examiner explained that the drawings were parts of various objects. A picture of the hammer is then shown and the test illustrated by pointing out to the subject the handle and head which are taken from the sheet by the examiner and placed beside the picture of the hammer. These parts are then replaced on the card. The subject is then instructed that he is to find the parts that make up another object. The examiner then places on the table beside the sheet the picture of the wheelbarrow saying, "Here is a wheelbarrow. Find its parts—the pieces that will make a wheelbarrow like this. Go!" The time is taken from the word "go" until the subject picks up the last part that is

needed to complete the object. As before, if the subject selects a part that does not belong to the object, the examiner, without comment, picks it up and restores it to its place on the sheet. If the subject stops the test thinking it is complete when a part or parts has been overlooked, the examiner waits 10 seconds and then says: "No; it is not all finished. Look again."

The other pictures are then shown and the subject's time in finding their parts recorded. The pictures are presented in the following order: Wheelbarrow, knife, coffee pot, chair. The hammer is used for demonstration only.

The subject's score is his total time for the form-board plus the time taken for assembling the parts of the four objects. Sixty seconds is the time allowed as a maximum for each object with the exception of the chair, for which 180 seconds is allowed. In the event of the object not being assembled in that time, the next picture is presented. The number of errors may be recorded but are not taken into account in the scoring. After each object has been assembled the parts are restored by the examiner to the form-board sheet, so that at the beginning of each test there is an equal field of choice. The replacing of the parts in this way also gives weight to the capacity to profit by experience. By the time the assembling of the chair parts is reached the subject has already picked up and used all the other pictures. He should thus have been familiar with their appearance and use and hence should not confuse them with the parts of the chair for which he is seeking. Because of the increasing complexity of the pictures the parts of which are to be assembled, the test has the characteristics of a graded series.

The test as a whole incorporates various interesting

features. To begin with, the form-board contains 22 objects which require to be matched. Manipulative skill is not called for as in fitting a wooden form into an inset. The emphasis is therefore on identification. The test is long enough to require sustained effort and the influence of chance successes is relatively minimized. The subject, in placing the objects on the form-board, becomes familiar with their appearance and may retain some idea as to their relative position, even though he may not know that he will be required to find the objects again.

Besides simple recognition and matching of forms the test involves the analysis of the picture of an object in order to determine what parts are needed to complete it, and the holding of a mental picture of the missing part in mind whilst looking for it amongst the collection of other objects. This is a factor which is almost lacking in a missing feature test, where the memory image of the missing part need not be carried in mind for more than a momentary period of time. Trial and error methods are almost eliminated, whereas they undoubtedly enter very largely into a mechanical construction or assembling test wherein the subject may try various parts in the wrong positions. Planning capacity enters very largely into the test, particularly of the chair. The method of the child who "builds" the chair by placing the parts around the picture in order, and who looks for a particular object, may be contrasted with the action of the child who picks up in haphazard fashion anything that looks as if it belonged to a chair. This method gives a quick scoring time, provided the subject does not overlook any portions such as legs or stays. It frequently happens that a child who adopts this method will not notice that the assembling is incomplete. The rule as previously mentioned

is for the examiner to wait ten seconds before telling the subject that the work is not finished. Probably the most intelligent method of attack is one which combines both methods, viz., the subject looks for a single object and picks up at the same time anything that "belongs," being careful, however, to check up at the finish to see whether all the parts have been found. This final checking up is what is so often neglected by the cock-sure or over-confident child.

Here, too, is another difference between the new test and others of somewhat similar nature. The factor of choice of relevant objects and the exclusion of irrelevant parts does not enter into the ordinary assembling test. In the latter, every part that is given is required so that logical choice has not the same influence as a factor. The new test, on the contrary, resembles rather the pictorial completion test in that the objects have to be selected from a field which contains much that is irrelevant.

Fundamental weaknesses of personality that are revealed by the test seem to be irresolution, heedlessness, over-confidence and lack of general mental alertness. These are undoubtedly involved in addition to the more specific intelligence factors previously mentioned.

Considering therefore the test's general character it is not surprising that it has a very high correlation with the Binet-Porteus average. One group of girls gave a correlation of .73 with the B.-P. average. When the test was modified to its final form the correlation for this group of girls when retested was .76. The range of Binet mental ages for this group was from 5 years 7 months to 13 years 3 months and the number of cases was 24.

A second group of 47 boys was then tested with the final form of the test and their scores correlated .83 with

Binet-Porteus age. For this group the new test correlated .74 with the Binet and .78 with the Porteus maze test. The results were also correlated with the average of the Binet and Porteus Diagnostic with a resultant coefficient of .83. The correlation of the new test with the Social Rating indices for this group was .65, which is about as high as either the Binet or the Porteus test taken singly. These results were so interesting that it was determined to repeat the experiment, using a group of 62 boys, all of whom were above 14 years of age. In this way the influence of chronological age was materially reduced.

The correlation of the new test with Binet-Porteus average was .76; with Binet age .70, and with Porteus maze test .68. The slightly higher correlation for the Binet serves to illustrate the ideational content of the new test.

The relation of the new test to social adaptability as measured by the social ratings scale is indicated by a correlation of .70. The Binet and the social rating for this group correlated only .63, the Porteus maze test .64. Apparently the new test has the closest relation to the social ratings. A "battery" consisting of a combination of the Binet, Porteus and new test ages correlated .75 with the social rating, whilst the Binet and Porteus combined gave a correlation with social ratings of .70. These results with the new test amply justify its inclusion in the battery. Any rise in the correlations above .70 is quite significant.

It should be noted that the new test's probable limit of usefulness is for mental ages from 6 to 16 years. It is noteworthy that normal adults very often take a longer time to complete the assembling of the chair than some high grade defectives. This is due in most cases to the adult's possession of ideals of precision which the child lacks. Little differ-

ences in the apparent length of parts, due to being seen in perspective, trouble the normal and add to his time. We have repeatedly drawn attention to the fact that a test may alter in character with the intelligence level. The question "What is the difference between a fly and a butterfly?" is a much more difficult test for an entomologist than for a child, wholly because he conceives the question differently and may feel it necessary to give a scientific reply, whereas the child gives apparent differences which are not universally true but which are scored as correct. In the same way the adult because of excessive caution makes the assembling test a more difficult test than does the defective. We would say therefore that the new test is not suitable for normal adults, nor, probably, for children above 16 years in mental age.

As a tentative scoring by mental age we are suggesting the following times:

Less than 110 seconds	18 years
110 to 120 seconds	17 years
121 to 130 seconds	16 years
131 to 140 seconds	15 years
141 to 150 seconds	14 years
151 to 160 seconds	13 years
161 to 175 seconds	12 years
176 to 190 seconds	11 years
191 to 210 seconds	10 years
211 to 250 seconds	9 years
251 to 300 seconds	8 years
301 to 400 seconds	7 years
Over 400 seconds	below 7 years

Other work with the new test will be reported at a later date.

* The application of the form and assembling test and the working up of data of this investigation was undertaken by Mr. Hans Kellerhals, formerly of the Polytechnical School, Zurich, Switzerland.

CHAPTER IX

EDUCATIONAL ATTAINMENTS SCALE

Within the last few years increasing efforts have been made to provide special education for defectives. Almost every school system reports some provision for the training of subnormals, whether by means of special classes or schools. Teachers have been transferred from ordinary schools or have been specially trained for this work. Notwithstanding the expenditure of large sums of money for these purposes, it has been recognized rather generally that the work fails in efficiency mainly because it does not go far enough. Too few systems have adequate "follow-up" schemes. The work of the school is not kept in close relationship with the after career of the scholar. Consequently, the teacher is very much in the dark as to whether the effort so laboriously expended bears any serious fruit as regards the better social adaptability of the pupils. Very little is known as to how much the pupils retain of their special school training or whether they use what they do retain. Opportunities for an educational stock-taking in the field of special education are apparently rare or are still more rarely availed of. The work is carried on with or without justification as regards results. The line of reasoning appears to be that because schooling is good for the normal, it must be good for the defective. Sometimes the assumption is made that the same kind of training fits both normal and subnormal. Almost invariably the assumption is that the same kind of

training fits all defectives. The prospective pupils having been duly "Bineted," all that is necessary then to do is to install a few woodwork benches, buy some basketry material, appoint a specially poorly prepared special teacher and the whole problem of the school training of defectives is happily settled. In an article by Mrs. Nash and the writer[1] the whole position is reviewed in the light of Vineland's experience and some practical suggestions making for economy of time and effort are put forth.

One of the suggestions of most importance to the organizers of special classes or schools for defectives was stated as follows:

"Children whose ultimate test level is no more than seven years should not be given any but the most elementary instruction in ordinary school subjects. If, as Terman supposes, the intelligence quotient in children tends to remain constant, then we are perfectly safe in extending this rule by stating that no child who has not an intelligence quotient above 50 or in other words, has not for his age made half normal progress in mental development, should be instructed in school subjects at all."

In another paragraph of this publication we stated our opinion that defectives below an ultimate nine year level of mentality should be taught only the simplest number operations, those which could be accomplished without the use of pencil and paper.

When the present study was undertaken it was determined to test the validity of these conclusions still further. The difficulty in rating the school attainments of defectives lay in the fact that no suitable measuring scale was available. The ordinary educational measurement scales were

[1] "The Educational Treatment of Defectives." By A. M. Nash and S. D. Porteus. Research Publication No. 18. Vineland Laboratory.

inapplicable because of their difficulty and because of the distances between the various steps in the scales. The scales which were already in use for defectives did not seem to have been devised with any special reference to the abilities of feeble-minded.

The present writer, with the assistance of Mrs. Nash, drew up the scales for measuring reading, spelling, number work and comprehension which are appended to this section. These scales with the exception of that for testing sentence comprehension, do not present any new features except the provision of very finely graded steps. By these steps small differences in ability are shown. The sentence comprehension test was added because we wished to compare the defective's ability to assimilate ideas with his mechanical reading ability. We wished to show that some children had developed ability to read mechanically far in advance of their ability to comprehend simple statements of facts when read to them—an admittedly easier task than when their attention is divided between the actual reading operation and the comprehension of the matter read.

Accordingly, we arranged in order of difficulty ten statements and ten questions based on these. The statements vary in length and the questions vary in complexity from those in which the child merely repeats verbatim a portion of the statement to those in which the terms of the statement must be modified to answer the questions. Memory and comprehension of the statements and comprehension of the questions are involved in a relevant answer. The test has the advantage of being somewhat easier than the ordinary completion test as it is less of a "literary" test and thus may be more easily graded to suit defectives. There are also

advantages in the fact that it may be given entirely as an oral test.

The factors considered in grading this test were the length of the response required, the position in the sentence of the statement to be given in response, and the length and complexity of the question.

If the answer is very short it is easier for the defective of low grade; if the fact to be elicited is stated last the problem is easier than if the statement comes first; the test is most difficult if the statement is given in the middle of a sentence. The more the question differs in form from the terms of the statement the more difficult it is.

This test has also been applied to normal school children, the average scores per grade and for each chronological age group being given at the end of this section.

The scoring of the educational attainments scale is on the same lines as those employed in the industrial scale. The basic score is the highest level reached without any failure. Points are added to this basic score for successes wherever attained above this level. For example, a child in the reading test scores up to step 5 without error and reads four words of step 6, three words of step 7 and two words of step 8, totalling nine words in advance of his basic score. Six words are required for score 6. Hence the child may be credited with step 6 and still have three advance credits left. Seven words are required to pass step 7 so that half credit may be allowed, the child's final score being 6½.

This plan of taking a basic score and using advance credits in place of tests that are failed is somewhat similar to that employed in the scoring of the Binet. Its advantages are that it obviates the necessity of an accurate grad-

ing of the test words or examples in order of difficulty—an order, of course, which varies a great deal with the varying experience of the subjects.

The education attainments scale was applied to two groups of subjects, one consisting of children still in school and one of children who had left school for more than five years. Sexes were almost evenly divided, and there was a similar range of mental ages. An interesting comparison was thus made possible on the basis of average scores and deviations. Because of the smallness of the numbers no very significant deductions can be drawn as to defectives' retention of school attainments. However, the present examination of cases may serve as the beginning of interesting investigations, both as to the rate of learning in the school group and also the curve of forgetting in the older children. A fixed point is now provided from which to measure and by repeated application of the scale over a term of years some interesting lessons for educational psychology may be obtained. The rate of learning of defectives and its relation to mentality can be easily determined in special schools and classes by this means. Although we are not able to present results of repeated measurements, the comparison of average scores obtained by us is very suggestive. Average scores and deviations, also the average Binet ages, are given for the four groups in Table 36.

One interesting feature in this comparison is that the boys who have left school are a point, or one tenth, less in average score in reading than the girls, and at the same time have a greater average deviation. This may indicate that the boys who have left school make less use of their reading ability. A comparison of the boys' scores reveals the fact that extremes in reading scores are frequent. There are

in the group of 32 boys 16, or 50%, who scored 10 or 9½ marks, whilst 8 (or 25%) scored 0, which means that they cannot read even a single word of three letters. The comparative infrequency of scores around the middle of the series seems to indicate that unless the boys reach a certain degree of efficiency, which appears to be about the seventh step on our scale, they make no use of reading and tend to lose whatever ability has been gained. Apparently there are no significant differences in either the averages or the deviations in the boys in school and out of school groups. The latter being of much higher chronological age might have been expected to have a better score than the younger boys. The highest scores are made in both groups in comprehension, but that may be due to the easy grading of the comprehension scale.

TABLE 36

SCHOOL ATTAINMENTS OF DEFECTIVES

Subject	Boys in School		Boys left School		Girls in School		Girls left School	
	Score	A. D.	Score	A. D.	Score	A. D.	Score	A. D.
Reading	6.2	3.0	6	4.0	5.6	3.5	7	3.5
Spelling	5.3	2.5	6	2.6	5.3	2.9	7	3.6
Number	6.1	2.5	6	2.6	5.2	2.6	6	2.5
Comprehension	7.1	1.6	7.5	2.3	6.6	1.8	7	2.4
Binet Average	8.3		8.6		8.5		8.7	

The girls out of school show rather decided advantages in average scores over those in school. This may mean that the girls are making more use of their school attainments and are hence retaining more. As regards the sex differences in attainments the boys in school make better average scores in reading, number and comprehension, and have their greatest advantage in number work. Boys out of school score distinctly less in reading and spelling, are level with the girls as regards number work and have the advantage in comprehension. This may indicate as before a greater use of reading and spelling by girls who have left school. As a matter of fact, the conditions of life in the institution provide a great deal more exercise for these abilities for girls than boys. The girls do a great deal more reading and, with a few exceptions amongst the boys, they do far more letter writing. Hence they have the advantage of continued exercise in both reading and spelling. As regards institution life it is apparently more worth while to spend time on teaching reading and spelling to girls than to boys. Many of the latter take no interest in letter writing, whilst the girls find a great deal of pleasure in sending and receiving home letters.

The differences in attainments level cannot be attributed to differences in mental level as the figures at the bottom of Table 36 show. All four groups average between eight and nine years Binet age. The left-school groups have a slight advantage in mental age, but this is probably due to chronological age.

Some significant conclusions may be drawn by a comparison of Binet mental ages and school attainments. In the left-school group only two cases with Binet ages below 7 years 6 months (or I. Q.s less than 54) scored above

five in average attainments in the four subjects of the scale. One of these (mentally 7^2) scored 10 in reading but only 3 in comprehension. The reading in such a case is therefore of a very mechanical nature and there is little capacity for assimilation of ideas. This is apparently a good instance of a defective being educated beyond her intelligence. In addition, she only scores 4 in number work. The other case is psychopathic. Her reading score is 9, and comprehension 7, indicating also a relatively lessened capacity to assimilate ideas. Of the 40 cases scoring 8 years or over, only five, or 12½%, do not score in average attainments over five points.

Of the children at present in school only one out of ten of those with I. Q.s below 50 have average attainment scores above five. This boy scores 9½ in reading and only 3 in comprehension showing that his reading is almost wholly mechanical. As it is not likely that these children will improve or even retain what they have learned it would seem a waste of time to continue the effort to teach them reading, spelling, or number work. According to our results seven years or an I. Q. of 50 is by no means too high a mental age limit to set in selection of children for instruction in these subjects. It should be remembered that proficiency as indicated by a score of 5 is not sufficient to enable a person to read and assimilate the ideas in a simple story, to write a simple letter, nor to do any but very simple mental operations in number.

As regards number work a child may be successful in passing all the steps of the scale up to 7 without the use of pencil and paper. Of 45 of the children either in or out of school who tested below eight years not a single child scored 8 points in the number scale. Two or only 4½%

scored 7 points in number. Hence it would seem quite safe to state 8 years Binet age as the lowest mental age level at which number operations involving the use of pencil and paper for working should be taught. Our figures make it appear probable that our previous limit of 9 years was too high.

As regards reading there are five children of the 36 with Binet age less than 7 years 6 months who score over 6 marks in reading; three of these five score so much lower relatively in comprehension that it is doubtful whether their reading is anything but of the most mechanical nature. These facts, if verified by further investigation, would show that there is at present a great deal of effort wasted on the teaching of reading, spelling and number work to defectives of too low a mental age to profit permanently by the instruction.

The correlations with mental ages are somewhat interesting. They have been worked out for the "left-school" groups only and are given in Table 39. By this table it will be seen that the Binet correlations with all subjects are consistently high except with comprehension in the case of boys. These coefficients show that on the basis of Binet age alone very accurate predictions can be made as to the school attainments. These results also go to prove the "scholastic" nature of the Binet test in the sense that it places an emphasis on learning capacity as applied to school work. The more concrete maze tests show very much lower correlations with educational attainments. At the same time the coefficients show that success in the maze test is related to learning capacity to a quite significant extent.

Apparently there are no very significant sex differences as regards the relation of educational attainments to test age.

Correlations of Binet with spelling and reading are higher in the case of boys. It has been previously explained that the girls both read and write more after leaving school than boys. Apparently it is only the most intelligent boys who keep up their reading practice.

TABLE 37

RELATION OF TESTS TO SCHOOL ATTAINMENTS

	Boys 32 Cases	Girls 26 Cases
Binet and Reading	r .74	r .68
" " Spelling	r .78	r .68
" " Number	r .79	r .76
" " Comprehension	r .58	r .76
" " Aver. Attainment	r .78	r .84
Porteus and Reading	r .50	r .33
" " Spelling	r .44	r .44
" " Number	r .53	r .50
" " Comprehension	r .44	r .52
" " Aver. Attainment	r .46	r .54

The inter-correlations of the single subjects are given in Table 38.

TABLE 38

CORRELATIONS OF SCHOOL SUBJECTS

	Boys 32 Cases	Girls 26 Cases
Reading with Spelling	r .95	r .86
" " Comprehension	r .64	r .78
" " Number	r .78	r .78
Spelling " Number	r .78	r .76
" " Comprehension	r .66	r .58
Number " Comprehension	r .72	r .62

The high correlation of reading with spelling might have been expected but the much lower correlation of reading with comprehension (especially with boys) would seem to show that many understand language well who do not read and that some who read do not comprehend well. As regards the lack of comprehension it is doubtful whether those with a difference of three or more points between their reading and comprehension scores are really taking in enough of what they read to make the occupation of reading a sufficiently profitable one. It is true that many of our children like to read and to display their reading ability, but they have only very hazy ideas of the subject matter read.

As regards the relation between improvement in educational attainments' score and increased mental age it might be noted that practically no average improvement in reading, spelling and number occurs after the ten year mental age is reached. There is a slight improvement in comprehension, but the average attainments do not vary after the ten years of mental age. Ten years mental age would thus seem to be about the limit of application of the scale. This would be about equivalent to fifth grade standing.

As a mental age of between ten and eleven years marks about the average borderline level the scale may provide some evidence of value to diagnosis. The scale has been made as brief as efficiency would allow, the idea being to make it easily applicable on a first examination of a child. The grade reached or reported to have been reached in school is of but little value as an indication of the child's level of attainments. The use of the scale will enable the examiner to obtain a more reliable estimate of the child's attainments. On the average the application of the whole scale requires about fifteen minutes. This examination would

serve as a preliminary test and results could, of course, be supplemented later by fuller tests.

The tests and scoring are given in the following pages:

EDUCATIONAL ATTAINMENT SCALE

Reading Test

1. cat rat mat
   Conditions of Success:—Child reads 1 of 3 words correctly — Score 1
2. pen pan dog
   2 of 3 words correct — Score 2
3. Can you see the man and his dog on the hill?
   3 of 4 words underlined correct — Score 3
4. A little red bird came down to get a drink from a cup of milk. A cat saw it and it flew away.
   4 of 5 words underlined correct — Score 4
5. A cat was looking at some birds one day and she said to herself, "How I wish I had one of those nice fat birds for my dinner." The birds heard her and flew away.
   5 of 6 words underlined correct — Score 5
6. One day a little girl named Mary found a hen sitting on a nest with a dozen eggs under her. In about three weeks there were eleven little white chickens around their mother.
   6 of 7 words underlined correct — Score 6
7. After a few bright sunny mornings in spring all the peach trees will come out in flower. The pink and white blossoms make a very

pretty sight indeed. In a little while the fruit will begin to form. Are you fond of peaches?

7 of 8 words underlined correct Score 7

8. The Sandman comes across the land
At evening when the sun is low
Upon his back a bag of sand
His step is soft and slow,
I never hear his gentle tread
But when I bend my sleepy head
"The Sandman's coming," Mother says
And Mother tells the truth always.

8 of 9 words underlined correct Score 8

9. The March Hare took the watch and looked at it gloomily; then he dipped it into his cup of tea, and looked at it again; but he could think of nothing better to say than his first remark, "It was the best butter, you know." Alice had been looking over his shoulder with some curiosity, "What a funny watch," she remarked, "It tells the day of the month, and doesn't tell what o'clock it is."

9 of 11 words underlined correct Score 9

10. In these times it is well for us to remember that we come of hardy stock. The Anglo-Saxon race, with all its strength and virtues, was born of hard times. It is not easily kept down; the victims of oppression must come of some other stock. We

who live in America and constitute the heart of this Republic are the sons and daughters of "Him that overcometh." We are descended from a race untainted by luxury, untouched by vice and uncrushed by oppression.

11 of 13 words underlined correct — Score 10

Spelling Test

1. cat mat fan
   1 of 3 words spelled correctly — Score 1
2. cat mat fan
   2 of 3 words correct — Score 2
3. see hill cup
   1 of 3 words correct — Score 3
4. see hill cup
   2 of 3 words correct — Score 4
5. girl play good
   1 of 3 words correct — Score 5
6. little found mother
   1 of 3 words correct — Score 6
7. flower bright eleven pretty
   2 of 4 words correct — Score 7
8. breakfast holiday prison
   2 of 3 words correct — Score 8
9. soldier ordinary several
   2 of 3 words correct — Score 9
10. separate recommend Christmas business
    3 of 4 words correct — Score 10

Number Test

1. Counting 3 objects
   Score 1

   Counting 4 objects
   Score 1½

2. Counting 5 objects
   Score 2
3. Counting 11 objects. $2 + 2$. $3 + 2$.
   2 of 3 correct Score 3
4. Counting 13 objects. $3 + 3$. $4 + 5$.
   2 of 3 correct Score 4
5. Counting by 2's to 20. $2 + 4 + 3$. $6 - 4$
   2 of 3 correct Score 5
6. $3 + 4 + 5 + 6$. $9 - 5$. How many cents in a nickel?
   2 of 3 correct Score 6
7. $14 + 26 + 17$. $27 - 8$. How many cents in 2 dimes?
   2 of 3 correct Score 7
8. $423 + 387 + 455$. $62 - 27$. 4×9.
   2 of 3 correct Score 8
9. $635 - 267$. 7×8. How many 4's in 32?
   2 of 3 correct Score 9
10. 76×8. 96 divided by 4.
    If an apple costs five cents, how many can be bought for half a dollar?
    2 of 3 correct Score 10

TESTS OF SENTENCE COMPREHENSION

Test—

1. The cat bit the rat.
   What did the cat bite?
   Correct answer—Score 1
2. The tin has milk in it.
   What is in the tin?
   Score 2

3. Mary likes to help her mother.
   What does Mary like to do?
   Score 3
   ("Help" is given half credit. If child gives an answer such as "sweep," "wash dishes," say "You were not told that in what I said. Listen again." Then repeat test.)

4. A girl found a dime and two nickels on the floor of her house.
   What did the girl find?
   Score 4
   ("20 cents" is given full credit)

5. John was sent to buy a strap for his skate at the store.
   Why did John go to the store?
   Score 5
   ("To buy a strap" half credit)

6. We hurried along all day and a little while after it was dark we reached the town.
   When did we reach the town?
   Score 6
   ("After it was dark" half credit. If child answers "seven o'clock" or an approximate hour, adopt procedure as in Test 3 and repeat)

7. One night in a dream a man saw a train stopping at a station.
   What did the man dream?
   Score 7
   ("A train stopping at a station" half credit)

8. The evening train to town travels much faster than the morning train.
   Why is the evening train better than the morning train?
   Score 8
   ("It has more speed", "Gets to town quicker", full credit; "Does not have as many stops" repeat test)

9. Of all the Continents, Africa has the largest animals in its forests.
   How does Africa differ from the other Continents?
   Score 9
   ("It has the largest wild animals" full credit; "It has the largest animals" half credit. If facts irrelevant to the statement in the test are given, repeat test as in tests 3 and 6 and 8.)

10. Fish, gold and furs are the most valuable commercial products of the territory of Alaska.
    What do people do for a living in Alaska?
    Score 10

General instructions:—Read statement and question to child, allowing an oral response. Record as basic score the highest step reached without failure. Add to this score advance credits for successes in any higher step.

For normal children this test may be used as a silent reading test, the answers in this case being written by the child.

With the courteous permission of Superintendent

Sickles 237 children in the third, fourth, fifth and sixth grades of the schools at Millville, N. J., were examined in this way. A and B divisions in each grade were given the test, the average ratings being given in Table 39.

TABLE 39

COMPREHENSION TEST

Relation of Grade and Age to Score

Grade	Cases	Ave. Score	Age	Cases	Ave. Score
III	50	4.8	—8 yrs.	10	4.4
IV	86	7	8 yrs.	41	5.75
V	57	8.5	9 yrs.	34	7.5
VI	50	9	10 yrs.	35	8
			11 yrs.	30	8.4
			12 yrs.	16	8.5
			+12 yrs.	11	7.4

There is a somewhat large interval between the average scores for the third and fourth grade. This may be due to the fact that the test was given as a group test in silent reading and as the answers were to be written, difficulties in spelling and writing may have influenced the score for grade III.

The test itself seems applicable at least up to grade VI. As regards its relation to age the average score increases fairly regularly up to age eleven years. The children over twelve years being somewhat retarded in their school standing have a lower average score than those at 11 or 12 years.

The limits of applicability of the scale given orally are from about five years to twelve years average intelligence. Given as a silent reading test the range is from about seven years to twelve years and from grade two to grade seven.

In the application of this scale and the working up of the data I am particularly indebted to Misses Pearson and Macfarlane of the laboratory staff.

CHAPTER X

AN INDUSTRIAL RATING SCALE

An analysis of the industrial attainments of defectives would serve two purposes. It would be advantageous to know, from the practical standpoint, what occupations defectives are best fitted for and to what levels of proficiency they may attain. Useful information would thus be supplied to those who may undertake their training, either for institution life or for the community at large. From the research standpoint methods that are more objective than those previously used for rating efficiency would be useful for correlating with mental test results in order to determine the prognostic value of these tests as regards industrial competency.

Accordingly the writer has attempted a job analysis of every occupation and industry pursued by the inmates of this institution. In this as in the social rating scale every possible use has been made of the experience of people who have been long engaged in the work of industrial training.

At the outset of the investigation, after obtaining estimates from various people as to the relative importance of various operations in an industry, we found ourselves extremely puzzled by divergent judgments. Neither in the job analysis nor in the comparisons made between the occupations themselves was there any very striking uniformity of opinion. Yet in order to get an industrial rating scale we required not only an analysis of each occupation into

steps of increasing difficulty, but we needed also a comparison of occupations on the basis of which a score earned by a worker in any occupation could be given a value relative to scores earned in any other occupation.

It was soon found that if the problem were analyzed and presented to the people piecemeal much more uniform results were obtainable. This partitioning of the problem consisted in setting forth the factors entering into each job or operation and which affected its difficulty for defectives The lists of operations in each industry were then presented to the industrial supervisors and they allotted ratings to each operation under the heading of each factor involved. By adding the ratings given by the supervisors, and taking the average, the comparative difficulty of each operation was determined. This order of difficulty was found to correspond fairly well with the average generalized judgment but the variability of the judgments obtained by the method of factorial analysis was considerably less than by the method of generalized judgments.

In passing it should be emphasized that this is not a scale of occupations but a scale of occupations for defectives. It does not by any means provide an exhaustive summary of all the operations concerned in the occupation, but only of those operations which defectives may encompass.

One of the factors which affect the difficulty of an operation for defectives is the manual skill involved. It was realized that very long training would be necessary for defectives to attain proficiency in certain jobs. The attainment of skill is, however, mainly a matter of practice. What the instructor cannot give to the child is the judgment that in most cases must accompany the manual operation. It is quite evident that some operations such as boot repairing

require judgment of form and size, discrimination of lengths, etc. This requires not only practice but good native ability. A third factor which affects the amount of practice afforded the child, is the value of the material worked with. It is obvious that because of the cost of the material, defectives could not be practised to the same extent in cutting out leather soles as they could in cutting out wooden forms. In poultry farming it makes a difference whether the material which may be injured or destroyed by carelessness or inefficiency is the egg, the young chicken or the laying hen. In the same way wasting seed on the farm would not be so serious a loss as injury to the young plant and not nearly so serious as damage to the fruit which has taken months of time to mature. Because of the relative value of the product picking of ripe sweet corn is a more difficult job than the picking of gooseberries. Mistakes in the one occupation are less serious than an error in the other. In housework the washing of glassware is entrusted to the more reliable children because of its greater value as compared with earthen-ware. It will be seen that operations in an industry vary much in respect to the value of the material employed.

Another factor that must be considered is the importance of the work. Certain operations may affect the well-being or health of others, and hence must be done with care and exactitude. An operation involving the handling of food is an instance in point. In housework the cleaning of the kitchen sinks need not demand either very great skill or judgment but because of its importance to hygiene must be done very thoroughly. Other jobs, because of like special circumstances, must be done with celerity and dispatch and hence are entrusted only to the brightest children. A case in point is waiting on table, which is done only by the most

mentally alert. Operations such as feeding animals which necessitate regularity and care in the apportioning of food are too important to be relegated to the comparatively inefficient or irresponsible.

Another factor that is involved is personal risk due to the conditions under which the work is carried on. This factor enters into the employment of tools, machines, animals, etc. The handling of a one horse team hardly involves the same risk as the control of a two horse machine. The use of hot water, sharp tools, the care of certain animals, the cleaning of windows, painting at heights above the ground, or electrical work, involve a varying element of risk either to the person engaged in the occupation or to others whom it affects. This factor also largely determines the selection of children for certain jobs.

These factors it will be seen, largely overlap. In fact it is judgment that determines the person's suitability for operations involving personal risk, or for very important jobs, or occupations using valuable material. Hence judgment is already rather heavily weighted. However, it was realized that it would be better to list these factors separately rather than to consider judgment as such, and attempt to weight it more scientifically. It is evident that there are different kinds of judgment. One kind of judgment may enter into the mortising of a joint and another into the handling of a team of horses. One kind of judgment may enter into the cutting of dress material to pattern and another into the picking and handling of ripe fruit.

A fifth factor that was considered was responsibility or the degree of supervision that was exercised. Obviously the boy on the farm must rely on his own judgment far more than the boy engaged in an occupation where the super-

visor is continually at the worker's elbow. However, this factor affects the different occupations as a whole rather than the single operations within an occupation. Hence it was thought more advisable to weight the occupations separately as regards this factor.

Finally, if machinery is used in the operation it may complicate its difficulty or it may add to the responsibility of the worker. Careless handling of the machine or tool may not only injure the material worked with but also the machine or tool itself. As a rule, only the highest operations involve the use of machinery, although many operations may require simple tools. Hence ratings were given to operations in proportion to the degree in which the use of tools or machinery complicated the operation or made the job of a more responsible nature.

The number of judges giving ratings varied with the occupations as follows:

Pantry and Kitchen Work	7
Dining Room Service	7
Poultry Farming	3
Housework	5
Dairying	4
Basketry	3
Fruit Growing	3
Wood Work	1
Shoe Repairing	1
Needlework	6
Cooking	6
Broom Making	1
Electrical Work	1
Power Plant	1
Loom Work	1
Truck Gardening	3

The ratings were obtained from all the experienced officers of the institution engaged in supervising the work of children in the various occupations. They were given on a 3 point basis under the headings mentioned above, namely, judgment, manual skill, value of the material that might be wasted or destroyed, importance of the work, personal risk to the worker, or nature of the tools or machines involved.

The ratings given by each judge for each operation were totalled. If more than one judge's estimates were used the totals were averaged. In this way the relative ranking of the operations was determined. The operations requiring the most skill and judgment, in which the most expensive material and the most complicated machinery and the greatest personal risk were involved received, of course, the largest totals. The factors could, of course, have been more scientifically weighted, but the value of these weightings was hardly worth the mathematical labor. The scale is therefore to be considered only approximately correct. However, as far as we were able to check up the results it was found that ratings of children by the scale accorded extremely well with the general estimates of the industrial capacity as given by the judges with most experience.

As previously mentioned, not only was it desirable to have a job analysis of each occupation but, if possible, a comparative ranking of the occupations themselves so that ratings in the various occupations could be converted into a comparative index of efficiency. It was obvious that the occupations containing the largest number of skilled or responsible operations would absorb only the most efficient children and hence deserved a higher comparative ranking. Accordingly the ratings given for each of the operations of

an occupation were totalled and the average rating of its operations was thus found. These average ratings were then taken as indicating ranking of the occupation on a scale. The boy who obtained a certain rating in farm work would be more efficient than the boy with an equivalent rating in housework. He must have mastered operations at a higher industrial level and thus was worthy of a proportionately higher "industrial index." Some proof of the correctness of our rankings of occupations is shown by the fact that the lower the occupation in rank, the lower the grade of child employed in it. Of course there are certain occupations low down on the scale which contain several high class operations which may only be done by high grade children. In such cases, however, this work will be usually done by children who are also scheduled to an occupation higher in ranking and hence have a chance to show an improved index.

This method, it must be admitted, provides only a rough, but certainly useful, comparison of occupations. The ranking of each occupation according to this method, together with the average rating of its operations stands as follows:

Occupation	Average rating of all operations
Fruit Growing Farm Work	12 Points
Woodwork Power Plant Shoe Repairing Dining Room Service Dairying	10.5
Cooking	10

Laundry Needlework	9.5
Broom Making Loom Work Poultry	9
Housework Basketry	7
Pantry and Kitchen	6

This list represents the average rating of each occupation, except as regards four occupations, viz., fruit growing, farm work, dining room service and poultry farming, in which there is less direct supervision and more is left to the child's initiative and resource. In all other occupations an instructor or supervisor is present in the room where the work is being carried on. Accordingly, one point has been added to the average rating of each of these four.

Whilst this list represents only an approximate ranking, a comparison of the mental ages of the children engaged in each show that, to be even moderately successful, children employed in the first five occupations must be of the highest industrial grades. Whilst a certain amount of farmwork can be carried on by children of low grade, those regularly scheduled to this occupation are among our highest grade children. With the exception of dining room service, none of the seven highest occupations are open to girls. Hence, girls are not likely, on the average, to obtain as high an industrial index as boys in proportion to their intelligence level. Needlework, for instance, occupies a comparatively

low place in the scale of operations. This is due mainly to the fact that quite a number of operations suitable to lower grade children are provided in this occupation and the work is done under constant supervision. As a matter of fact, the range of occupations suitable for girls and which call for any considerable amount of judgment and skill is very narrow. It is probable that very many of the high-grade girls are not employed to the limit of their mental or industrial capacity.

After the job analysis on the lines described above had been provided for each occupation, every industrial department of the school and institution was visited and the child's proficiency recorded according to the scale. In allotting a rating to the child all the operations which the child could encompass with only general supervision were noted. By "general supervision" was meant the mere over-seeing of the task without specific instructions.

It will be noted by reference to the list of occupation analyses appended to this section that two or more operations are often given the same rating. In allotting to the child his proficiency index, the procedure was to take as basic score the highest step in the scale in which the child was successful in all the operations listed for that step. The number of advance credits, i. e., operations in higher steps, was then counted and these were considered as continuous successes and additional credit given according to the number of full steps this was equivalent to. The procedure is best illustrated by an example. We will suppose that a girl's basic score in needlework is 5—that is to say, step 5 in the scale is the highest step in which she is successful in all the operations listed for that step. She also can do 3 out of the 4 operations rated 6 and 1 of the 3 operations rated

7. Hence, she obtains 4 advance credits and, as 3 operations are necessary to obtain rating 7, this is the score allotted to her. In the event of a child obtaining in this manner enough credits for a half step, it is scored accordingly.

For correlation purposes we have decided to present results for four separate groups of children. Two groups consists of children rated in a single occupation, one for boys and one for girls. The two other groups consists of boys and girls whose ratings have been obtained from a variety of occupations and converted into industrial efficiency indices according to the scale. Because of the relatively lower ranking of girls' occupations the results for the series have been treated separately.

The occupation chosen for boys was woodwork and ratings were obtained from the class instructor on 43 boys, limiting the selection to those who have had more than one year's instruction. This was to equalize, to a certain degree the effect of previous experience. These ratings were then correlated with the Porteus and Binet test ages of the subject and also with the average of the Binet and Porteus test ages. Efficiency in woodwork correlated .6 with Binet age, .72 with Porteus age, and .78 with the Binet-Porteus average. These results confirmed those previously obtained which showed that the composite mental age was the best indication of industrial efficiency.

A similar group of 43 girls was rated in needlework by their instructor according to the scale. Efficiency in this occupation correlated .84 with Binet age, .88 with Porteus age and .92 with Binet-Porteus average. As before mentioned, needlework contains a number of operations suitable for children in the lower grade of intelligence as well as

others suitable for the higher grade. Hence the group contained a fairly wide range, both of mental ages and industrial efficiencies. Under these circumstances, the correlation coefficient is relatively higher than if a narrower range of abilities had been included. It has been pointed out that the higher the standard deviations of the ratings the higher the correlation tends to be. With the more homogeneous group a lower correlation than this would be just as significant. However, the coefficients as given represent the comparative value of the tests in question and are, therefore, very significant.

It was realized, however, that ratings in a single occupation might not give a fair picture of the industrial aptitudes of the children. Certain children have had less opportunities than others in certain occupations and may possibly rate higher in another in which they have greater interest or experience. Certain lower grade children might obtain low ratings in woodwork and much higher in occupations such as housework where they are more regularly employed and where there is provided a greater range of operations suited to lower intelligences. As previously mentioned it was determined to take a group of boys and another group of girls and obtain their industrial ratings in a variety of occupations, convert them into equivalent scores according to our scale of occupations and then to correlate their highest relative rating with mental tests. Unfortunately, there was only sufficient time to use the Binet and Porteus tests for these purposes. Undoubtedly, it would have been of great interest to have correlated other test results in a similar way. The industries for which ratings were obtained were as follows: For boys, farm work, woodwork, laundry, dairying, poultry farming, housework, dining room and pantry service. For

girls the occupations under which ratings were given were: Needlework, housework, dining room and pantry service. The ratings were given by the supervisors and then converted by means of the table given with the scale of operations at the end of the section. As previously explained, this table gives the value of an occupational rating in comparison with a similar rating given in the highest occupations in our list. As an example, a rating of 10 in kitchen work is worth only 5 in relation to a similar rating in farmwork. The reason for this different value is that a child to obtain a rating of 10 in farm work must be proficient in jobs requiring approximately twice the judgment, skill, etc., involved in the highest operation in pantry work.

TABLE 40

CORRELATION OF MENTAL TESTS WITH INDUSTRIAL EFFICIENCY INDICES

Test	Woodwork 43 boys	Needlework 43 girls	Industrial Index boys 41	Industrial Index girls 35
Binet	.60	.84	.62	.69
Porteus	.72	.88	.80	.81
B.-P. Aver.	.78	.92	.81	.83

The correlations between industrial ratings converted in this way and mental tests are as follows:

Binet and Industrial Indices:

Boys $r = .62$

Girls $r = .69$

Porteus and Industrial Indices:

Boys r = .80

Girls r = .81

Binet-Porteus Average and Industrial Indices:

Boys r = .81

Girls r = .83

These figures provide further proof of the close relation of Porteus maze test age to industrial aptitudes and thus confirm the results found in a previous investigation and those obtained by Miss Ross in Scotland. The job analyses are appended to this section together with conversion values in terms of the "industrial index."

In collecting ratings from cottage attendants and supervisors of the various industries care must be taken to impress on them that a child should only be credited with the operation that he can do without direction. It is frequently remarked that a child can perform an operation imperfectly, which means that the work is done only under direction. The child should not be credited with the operation in this case. At the same time, perfection of execution is not expected. Wherever possible, the ratings of two or more observers should be obtained and averaged.

Naturally, the scale will require alterations to suit different conditions in other institutions. The principles of arrangement, however, may remain somewhat the same.

With the provision of this scale we are prepared to attack the problem of the rate of acquirement of industrial skill in its relation to mental test records. As is the case with the educational attainments, light on the question of rate of development should result in economy of time and effort in the training of defectives. This data can, of course, be obtained only by repeated applications of the scale to the same children.

However, even in its present imperfect form, the scale should provide useful information as to the occupations most suited to defectives and the steps through which their training should pass.

NOTE:—The section dealing with the Industrial Scale has been worked up with the assistance of Mrs. Nash and Mr. L. N. Yepsen, to both of whom the writer is much indebted, both for the collection of data and for aid in the treatment of results.

TABLE 41

CONVERSION TABLES OF OCCUPATION RATINGS

Farm Work
Fruit Growing

Step	Indust. Index
10	100
9	90
8	80
7	70
6	60
5	50
4	40
3	30
2	20
1	10

Dairy
Dining Room Service
Shoe Repair Shop
Woodwork Room
Power Plant

Step	Indust. Index
10	88
9	79
8	70
7	61
6	52
5	44
4	35
3	26
2	17
1	8

CONVERSION TABLES (Cont'd.)

INDUSTRIAL RATINGS

Cooking		Needlework	
	Indust.	Laundry	Indust.
Step	Index	Step	Index
10	83	10	79
9	75	9	71
8	66	8	63
7	58	7	55
6	50	6	48
5	41	5	40
4	33	4	32
3	25	3	24
2	17	2	16
1	8	1	8

Broom Loom Poultry		Housework Basketry		Pantry Kitchen	
	Indust.		Indust.		Indust.
Step	Index	Step	Index	Step	Index
10	75	10	58	10	50
9	67	9	52	9	45
8	60	8	46	8	40
7	52	7	40	7	35
6	45	6	35	6	30
5	37	5	29	5	25
4	30	4	23	4	20
3	22	3	17	3	15
2	15	2	12	2	10
1	7	1	6	1	5

TABLE 42

INDUSTRIAL RATING SCALE—NEEDLEWORK

Operation	Rating	Industrial Index Value
Pulling out bastings Threading large needle	1	8
Threading fine needle Overcasting seams Simple basting stitches	2	16
Sewing on buttons Using thimble	3	24
Gathering Putting in pockets Sewing on hooks and eyes	4	32
Turning up hem Sewing on snaps	5	40
Fitting neck Making simple apron Making button-holes Finishing vents	6	48
Putting in pockets Fitting garments Putting in sleeves	7	55
Cutting from pattern Threading machine bobbin	8	63
Running foot electric machine	9	71
Making simple garment throughout	10	79

INDUSTRIAL RATING SCALE—WOODWORK

Operation	Rating	Industrial Index Value
Sandpapering Hammering large nails Sawing at random	1	8
Planing at random Making nail joint	2	17
Using simple screwdriver Holes with drill	3	26
Finishing—stains, etc. Using brace and bit	4	35
Hammering small nails Making a screw joint	5	44
Using try-square	6	52
Sawing to a line Making dowel joint Using automatic screwdriver	7	61
Cutting to a circle Using jig saw	8	70
Using mitre box Making mortise tenon joint Putting furniture together	9	79
Making pegged joint—mortise and tenon Planing to a line	10	88

INDUSTRIAL RATING SCALE—POWER PLANT

Operation	Rating	Industrial Index Value
Shovelling and wheeling coal and ashes Cleaning yard and floor	1	8
Filtering oil, cloth Filtering oil, chamois	3	26
Cleaning outside of machine Cleaning outside of boiler	4	35
Cleaning outside of pumps	5	44
Oiling engine when stopped Starting boiler	6	52
Blowing and cleaning tubes	7	61
Oiling pumps in operation	8	70
Cleaning fires Making of first fire under boiler Feeding the start. with coal	9	79
Firing after boiler is started Oiling engines in operation	10	88

INDUSTRIAL RATING SCALE—SHOE REPAIRING

Operation	Rating	Industrial Index Value
Sewing on buttons	1	8
Ripping apart old shoes Polishing shoes (hand)	2	17

Polishing shoes (machine)	3	26
Mending soles Ripping soles	4	35
Heeling shoes (rubber)	5	44
Finishing edges—heel and sole (machine) Putting in an inner-sole Finishing edges—heel and sole (hand)	6	52
Heeling shoes (leather) Sewing on labels Trimming edge—heel and sole (machine) Trimming edge—heel and sole (hand)	7	61
Preparing shoes for repair	8	70
Re-inforcing eyelets Repairing button-holes	9	79
Sewing uppers, vamps Cutting soles Using nailing machine	10	88

INDUSTRIAL RATING SCALE—DAIRYING

Operation	Rating	Industrial Index Value
Wheeling manure to shed	1	8
Cleaning barn	2	17
Cleaning milkhouse	3	26

Cleaning cows	4	35
Feeding young stock	5	44
Cleaning milk cans Disinfecting barn	6	52
Stabling cows Milking old cows (hand) Weighing milk	7	61
Cleaning milking machine Cleaning separator Stripping cows (after machine)	8	70
Running separator Feeding cows Milking fresh cows (hand) Care of males	9	79
Care of sick cows Running milking machine	10	88

INDUSTRIAL RATING SCALE—ORCHARD AND VINEYARD

Operation	Rating	Industrial Index Value
Gathering fallen fruit	1	10
Hoeing around trees Picking gooseberries	3	30
Picking grapes Picking raspberries	4	40
Sorting picked fruit Thinning fruit	5	50

Searching for borers Picking apples Spraying small fruit	6	60
Picking peaches	7	70
Pruning	8	80
Spraying vineyard	9	90
Spraying orchard	10	100

INDUSTRIAL RATING SCALE—TRUCK GARDENING—FARM WORK

Operation	Rating	Industrial Index Value
Gathering potatoes Pulling weeds	1	10
Picking beans Cutting weeds	2	20
Picking peas Setting lettuce	3	30
Hand cultivator Thinning beets Harvesting hay	4	40
Harrowing Horse raking Picking sweet corn	5	50
Care of hot bed Lime spreader One-horse cultivator	6	60

Care of celery Plowing Manure spreader	7	70
Transplanter driver Fertilizing machine	8	80
Transplanter operator Two-Horse cultivator	9	90
Corn binder Spraying machine Potato planter Mowing machine Grain drill	10	100

INDUSTRIAL RATING SCALE—PANTRY AND KITCHEN

Operation	Rating	Industrial Index Value
Emptying and cleaning garbage Scraping plates Washing vegetables	1	5
Polishing silver	2	10
Cleaning sink Care of bread box	3	15
Preparing berries Care of ice box	4	20
Preparing celery Preparing lettuce	5	25

Washing flatware	6	30
Care of urns Care of ice-cream freezer	7	35
Care of meat chopper	8	40
Washing handleware	9	45
Washing glassware Cutting bread	10	50

INDUSTRIAL RATING SCALE—BASKETRY

Operation	Rating	Industrial Index Value
Washing raffia Braiding Making napkin ring Raffia over pasteboard	1	6
Making simple reed mat	2	12
Soaking materials	3	17
Making knotted bags Making reed and raffia in simple combinations Simple reed baskets	4	23
Making wood and reed trays	5	29
Splitting willow for baskets Making reed napkin rings	6	35
Making flower holders, glass and reed Making willow baskets	7	40

Making and lining knotted bags Sweet grass basket with top Dyeing raffia Making reed baskets	8	46
Using reed and raffia in different combinations	9	52
Making wood, reed, raffia and glass trays	10	58

INDUSTRIAL RATING SCALE—HOUSEWORK

Operation	Rating	Industrial Index Value
Care of trash box	1	6
Care of spigots, knobs, etc. Care of porch	2	12
Cleaning of stairs Dusting of furniture Polishing floors	3	17
Sweeping board floors Dusting of walls Airing of mattresses	4	23
Sorting soiled linen Cleaning around radiator Sorting of clean linen Waxing of floors	5	29
Scrubbing of floors	6	35

Making of beds Care of tubs, bowls, etc. Cleaning of pictures	7	40
Care of linoleum Care of flush	8	46
Sweeping carpets Cleaning of beds Scrubbing walls Washing windows	9	52
Care of electric shades	10	58

INDUSTRIAL RATING SCALE—POULTRY

Operation	Rating	Industrial Index Value
Cleaning houses	1	7
Sorting eggs Gathering eggs Care of feedhouse	2	15
Watering stock Bedding houses	3	22
Picking fowl (wet) Incubation (hen)	4	30
Counting and packing eggs	5	37
Picking fowl (dry) Disinfection Mixing feed	6	45
Feeding stock	7	52
Trap nesting Care of young chicks	8	60

Care of brooder Culling flock	9	67
Care of incubator	10	75

INDUSTRIAL RATING SCALE—BROOM MAKING

Operation	Rating	Industrial Index Value
Sandpapering handles Seeding the corn	1	7
Tearing apart old brooms	2	15
Finishing broom cap, etc.	4	30
Grading of corn	5	37
Using thimble	6	45
Sewing broom Trimming broom	8	60
Forming ball at start of broom		
Winding wire on machine Putting on outside whorl	9	67
Forming heart of broom Forming shoulder of broom	10	75

INDUSTRIAL RATING SCALE—LOOM WORK

Operation	Rating	Industrial Index Value
Rolling rag balls	1	7
Filling shuttles	2	15
Preparing carpet rags (old)	3	22

Preparing carpet rags (new)	4	30
Weaving rag or jute rugs (two-harness loom) Knotting ends	5	37
Weaving roving rugs Threading two-harness loom	6	45
Making rugs with borders Dyeing carpet rags	7	52
Weaving chenille rugs Removing and cutting rugs for finish Making pick-mark rugs	8	60
Warping two-harness loom Weaving on four-harness loom	9	67
Warping four-harness loom	10	75

INDUSTRIAL RATING SCALE—LAUNDRY

Operation	Rating	Industrial Index Value
Shaking out clothes for mangle and dryer Hanging clothes on line	1	8
Taking clothes from line Sorting soiled clothing	2	16
Ironing simple colored pieces	3	24
Starching (cold starch) Sprinkling machine Attending dryer	4	32

Attending towels at mangle	5	40
Sorting clean ironed clothes	6	48
Packing baskets for cottages Attending bed linen at mangle	7	55
Ironing white skirts by hand Starching (hot starch)	8	63
Packing ringer Ironing shirt waists by hand Ironing collars and cuffs Attending table linen at mangle	9	71
Packing extractor Running body machine	10	79

INDUSTRIAL RATING SCALE—COOKING

Operation	Rating	Industrial Index Value
Cooking of cereals Cooking of plain boiled vegetables Making of toast Cooking simple egg dishes	2	17
Making individual salad Making tea and coffee	3	25
Making boiled salad dressing Making puddings—rice Making hot cakes Making of pickles Cooking creamed vegetables Making mayonnaise dressing	4	33

Broiling fish Baking pork and beans Making of muffins	5	41
Making of gravy Frying meats, fish, etc. Making of soups Making of salad to be served Making of biscuit	6	50
Making of omelettes Planked shad and meat Roasting of meats Making of raised bread	7	58
Frying of oysters Preparation and frying of chicken Making of cakes	8	66
Preserving Making of pies	9	75
Frying doughnuts Preparation, stuffing and roasting of fowl Making ice cream Making jellies	10	83

INDUSTRIAL RATING SCALE—DINING ROOM

Operation	Rating	Industrial Index Value
Placing chairs at table	2	17

Setting up table	6	52
Placing food on table	7	61
Table service—directed	8	70
Table service—undirected	10	88

CHAPTER XI

CHILDREN—NOT CASES

In the preceding pages much has been written of the defects of personality in the feeble-minded, of their educational and industrial incapacities, of their psychopathic and delinquent tendencies. Their shortcomings have been set forth and analysed, but no single word has been said of their virtues until the reader might think the psychologist has forgotten the all-important fact that they are human. Suggestible, impulsive, unforeseeing, ineffective though they may be, they, too, have their share of human kindliness, sympathy and thoughtfulness. Forbidden to go unguided in the community at large, in their own world they assume fine duties and real obligations, render unselfish service, live towards ideals and so make their lives livable and lovable. No study of the feeble-minded could be thorough or complete unless some account were taken of this truly human side of their lives and actions.

Here, for instance, is Tim—old, white-haired and decrepit at forty, but with the smiles and tears of a child. Tim proudly wears a collection of medals and buttons on his coat, but treasures in his soul every kindly word or smile that greets him as he upholds the onerous duty of institution errand boy. Tim used to run errands once, but now he walks, and every year walks slower and slower. Still, on the rawest, coldest morning of mid-winter you may meet

him battling along cheerily, doing faithfully what he deems a most important service. What though Tim thinks the laborer worthy of his hire and looks expectantly towards the desk where, perhaps, a box of candy might lie. You may forget your manners by neglecting to offer him a piece, but Tim never forgets his manners so far as to ask for any. He may say gently, as he politely withdraws from your room, "You know, I had a lovely dream last night. I dreamt you gave me such a fine piece of candy." But as for asking for a piece—not on Tim's life. Still, pay or no pay, candy or no candy, Tim will come just as cheerily the next time with his errand, and, though his bones ache and his step is dragging, he will do his task without slacking, amply repaid by the word or the smile of good-will.

Tim, like all the rest of us, likes the lime-light. But do not think that his is an obtuse obtrusiveness—Tim's soul is very, very sensitive. A little teasing or a slight to his dignity and there are tears. But, with the emotions of childhood Tim has also kept the faith of a child. When the children of the Training School are gathered together on Christmas Eve to await the arrival of Santa Claus with his jingling sleigh bells and huge bag of gifts, Tim is always there, aglow with expectation. Every tinkle of the telephone which announces Santa's progress through the neighboring towns adds to Tim's excitement. Tim never fails to fall into black despair when Professor Johnstone announces—as he always does—that Santa's auto has broken down at Newfield, and Tim's spirits assuredly rise again with the glad news—which also never fails—that Santa has abandoned his auto and is coming on by aeroplane. Tim is the first to meet him and to shake his hand as he comes, greeting the children in his great rough voice, from the

stage of the hall. Nor could all the wise men of earth persuade Tim that this is not the real Santa. If you did try to persuade him thus, that would simply prove you aren't wise. Good luck to you, Tim, and many more happy Christmases!

Nor must we forget Louisa, friend of little children—Louie, with her gentle voice and quiet step; faithful, too, to her trust. Louie was not always good and quiet. She will tell you how, twenty years ago, when the "quiet" was part of the institution discipline, she was confined for several days there in solitude for impudence and disobedience. Even now should Louie's sense of justice, either as regards herself or those she loves, be offended, she has large stores of righteous and unrighteous anger to draw upon for her or their defence.

Louie is chief helper in kindergarten; nor could all the college training nor all the intelligence of the expert kindergartner add one tittle to the love and care that Louie brings to her task. Mild example, kindly precept, untiring sympathy, wise understanding are Louie's possessions to a degree that the highest mental age would fail utterly to express. Yet Louie's record reads 8 years Binet, 10 years Porteus, or some such nonsense. Perhaps it is the blind leading the blind, but, if so, it is with an understanding of the pitfalls and the ugly corners and all the rough places that seeing people miss. It has been my good fortune to watch Louie's handling of a little normal boy, full of high spirits, naughtiness, and five-year-old imperiousness, and it was always fine—fine in its solicitude, in its tenderness, in its wisdom.

Nor are such cases rare amongst the feeble-minded. There is Dan, great, rough, rugged Dan, with no great

strength of mentality, it is true, but strong in honesty, in faithfulness, in diligence, in character. He, too, shoulders responsibility, and carries it unfalteringly. What is within the limits of Dan's capacity will be done well. Others may slacken and shirk, but Dan goes forward till the toll of the day's work is complete. Day after day, year after year, without any meed of praise or encouragement, seeking for no reward, Dan goes about his appointed task. Six feet, strongly built, with a slight limp, not handsome but with lines of strength in his face, Dan's appearance matches well the solidity of his character. It is useless to quote his mentality for mental age takes no account of manliness and trust. He, too, has a big heart for little children and may be seen occasionally guiding two of his charges about the grounds.

Then there is Charlie, a fine instance of one who obtains and bestows happiness through a discovered talent. Charlie, too, is rough and rugged and unlovely, but he plays the cornet wonderfully. From what unsounded depths in his apparently simple and shallow soul Charlie draws such wonderful cadences there is no telling. Imitation, long training, say some, but if Charlie has only a genius for imitation it is still a genius. No school entertainment would be complete without Charlie's solos. Like most artists, he is fully conscious of his artistry, and, like the songsters of the woods, he visibly swells with pride as he performs. But why shouldn't he? You may laugh at Charlie before and after, but not while he plays. Charlie's supreme ambition is to have his picture enlarged and hung in the assembly hall of the Training School alongside of the founder of the institution so that children will point to it and say, "There is the boy who played the cornet and gave so much pleasure to

the children of the school." I, for one, hope his ambition will be realized, for not only children, but many normal people owe a great debt of lasting pleasure to Charlie's playing.

Travelers from all over the world are lost in amazement at the monoliths of stone that people of a bygone age, all unwitting of the ways and means of modern engineering, have erected at Stonehenge or on the bare Pacific slopes of Easter Island. But we have at our Menantico colony a monument to human persistence in pitting weakness against great odds, a monument that is, in its small way, just as remarkable as any monolith. Larry, an under-sized, partially paralyzed, one-armed boy, has made such a monument. Unaided, he has erected a merry-go-round that actually works. It consists of a tree sunk solidly into the ground, bound at the top with an iron band, upon which, as an axis, is balanced another tree trunk over 40 feet in length and about 8 inches in diameter. This is fastened securely so that it will revolve. Suspended from its ends, which are about 6 feet off the ground, are seats, so that when this horizontal beam is pulled round you may ride as in a merry-go-round. The swamps where these trees grew are over a quarter of a mile away across sandy ground, rough with stumps and hillocks. There is a steep sand bank about 20 feet above the level of the swamp which must be surmounted. With his one sound arm and a hook in the elbow of the other, Larry has performed the work of felling these trees in the swamp and stripping them of bark and branches. Then he has levered them on to a small two-wheeled hand cart and transported them, one by one, inch by inch, one wheel at a time, up the hill and across the rough field to the site of his merry-go-round. This has been Larry's self-

appointed task for many months. Some days he has only succeeded in making a foot of progress for a hard day's labor. But now the work stands, representing visibly the plan and the vision that took shape in Larry's darkened soul. His is a measure of achievement that would be hard to surpass. Larry has literally, not figuratively, sweated blood in its accomplishment, as his gnarled and blistered hand will show. Days of struggle and nights of planning have erected no greater monument to human determination, courage and persistence than Larry's one arm and stunted body and seven-year-old intelligence have set up. Some may exclaim, "What fruitless and wasted effort!" But many of us, too, are merely building merry-go-rounds, and why shouldn't Larry build his?

Even the most delinquent have their good points and the psychopathic are not as black as they are painted. There is Joe—as clear-eyed, fresh-faced and as handsome a little Italian tough as ever drew knife in Sicily. Wicked, trouble-making imp of darkness, potential gangster, spawn of nobody knows how many generations of vendetta and passion, Joe still shows bright, though fleeting glimpses of the sunniness of Southern Italy in his nature. Music comes naturally to him and herein, perhaps, will be discovered his saving grace.

Robert, "batty as they make them," as his fellows describe him, talking to himself incessantly, suspicious and morose, easily enraged by teasing, has achieved institution fame and, incidentally, self-restraint and self-respect through a discovered talent on the baseball field. So we might go on through a long list of children whose qualities of heart and character are by no means over-shadowed by their deficiency of intellect.

These final pages may seem out of place as the concluding chapter of a book with a presumably scientific purport. I have not hesitated to include them as my tribute to the one under whose hand the Training School has developed, and to his people, without whose years of loyal effort and devotion these children of diminished mental powers could not have grown so fully towards self-fulfilment and happiness.

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